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# AMERICAN ARTISAN

WARM AIR HEATING • AIR CONDITIONING  
SHEET METAL CONTRACTING



AIR  
CONDITIONING  
SECTION

PAGE 35

ESTABLISHED  
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AUGUST  
1938



# 7 OUTSTANDING SERVICE FEATURES *that save* TIME AND MONEY *for users of*

## LAMNECK PREFABRICATED DUCT AND GRAVITY PIPE, FITTINGS AND REGISTERS

The complete Lamneck plan comprises three advantages that are unique in the industry. First, a product of highest quality in Lamneck Simplified Prefabricated Duct. Second, a definite Jobber Policy which offers absolute protection to jobbers and dependable localized service to dealers and manufacturers. Third, outstanding service features which save time and money for all Lamneck customers and increase their profits. These features include:

### **CATALOG 38, SERIES 600**

This practical book shows photographs of all items in the complete Lamneck Simplified System, together with descriptions, sizes and prices for easy reference. Compact and convenient. Furnished without charge.

### **TAKE-OFF SHEETS, SERIES 600**

An ingenious device for tabulation of fittings. Saves hours of time and hard work in estimating. Positive check against costly errors and omissions. Prices in red opposite each item. Furnished without charge.

### **PAN-O-RAMS**

Printed on fine quality parchment tracing paper, size 24" x 18". The border consists of clearly printed drawing, with measurements to scale, of the various important details of the complete air distribution system. Furnished at cost of 7½ cents per sheet.

### **INSTALLATION MANUAL, SERIES 600**

A 20-page book, which explains clearly and in detail how to assemble and install Lamneck Prefabricated Duct. The method of instruction is so simple and easy to understand that successful installation is insured if instructions are followed. Saves time and labor. Furnished without charge.

### **LAM-O-GRAPH**

A set of simple charts which provide an easy short-cut method of estimating dealer costs on the Lamneck Prefabricated Duct and Fittings required for an installation. Gives close approximate price "on the spot." Furnished free of charge.

### **GRAVITY CATALOG 38**

Complete catalog of Lamneck Furnace Pipe, Fittings and Registers. For 21 years these Lamneck products have set the standard of quality in the industry. A fully illustrated buying and selling guide. Furnished without charge.

### **TAKE-OFF SHEETS, GRAVITY**

The same idea as for Prefabricated Duct applied to the tabulation of Gravity items. Saves time and labor. Furnished free.



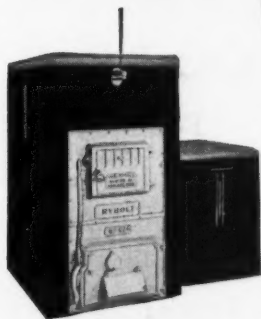
**LEADERS FOR 21 YEARS  
IN GRAVITY PIPE, FITTINGS AND REGISTERS  
LEADERS FOR 4 YEARS  
IN PREFABRICATED DUCT AND FITTINGS**

**LAMNECK PRODUCTS, INC.**  
414 DUBLIN AVENUE • COLUMBUS, OHIO

**PREFABRICATED DUCT AND FITTINGS FOR ALL TYPES OF  
WARM AIR HEATING AND AIR CONDITIONING SYSTEMS**

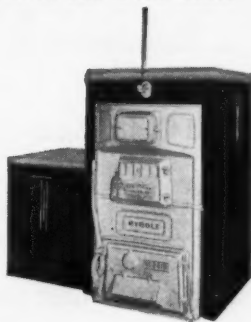


# A RYBOLT UNIT FOR ANY HEATING NEED!



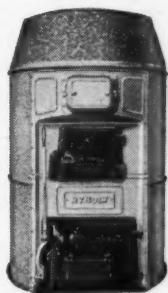
The Series 600A7 Rybolt Winter Air Conditioning Unit shown at the left has as its heating element the new 600 Series Steel Rybolt furnace. Every advantage associated with warm air furnaces of the steel type, such as quick response to firing, ease of cleaning, and gas-tight construction, will be found at its best in this model.

Shown at the right is the Series 157 Rybolt Winter Air Conditioning Unit, which has as its heating element the Series 157 Rybolt Cast Iron furnace. This furnace has slip-on fronts, surface ground ashpit and feed door joints, one-piece radiator, and Rybolt duplex ball bearing grate, all important factors of efficient, economical, and clean operation.



A worthy companion to the cast iron furnace is the new steel furnace. Scientific design to produce more efficient heat and the famous Rybolt construction make this furnace good for years of economical and trouble free heating.

The famous five point Rybolt cast iron furnace is one of the few furnaces on the market that combines beauty, quality, efficiency, strength and price in one unit and is still priced low enough to appeal to all your prospects.



At the left is shown the gas-fired winter air conditioning unit. Ultra modern in design, it will harmonize with any basement decoration scheme. Easily adjusted and installed and built to give years of clean healthful economical heat. A sure-fire seller that will earn you handsome profits.

No matter what kind of a warm air heating situation you run up against . . . there's a time-tested RYBOLT unit to help you solve the problem. We've been solving problems for heating men for well over a quarter of a century and we're pretty sure we can take care of any situation you can show us. The RYBOLT line includes furnaces and air conditioning plants for any home, new or old. You can save a prospect money, and at the same time give him the best obtainable heating job by installing either the famous RYBOLT five point cast-iron furnace or its worthy companion . . . the steel furnace. Or if he wants an air conditioning installation . . . specify the Series 600A7 or Series 157 air conditioning units or the recently announced gas-fired air conditioner.

In any case . . . when you install a RYBOLT heater you know in advance that the job is in to stay and that you won't be bothered with troublesome call-backs.

Write us NOW for further information.

**COMING SOON**

ANOTHER

**RYBOLT**

MONEY-MAKER

WATCH FOR IT!

**THE RYBOLT HEATER COMPANY**

**ASHLAND, OHIO**

## In This Issue

**T**HERE are many sheet metal firms, now operating, whose active history dates back to the beginning of this century. It is doubtful, however, if any one firm has paced the growth of its home town more closely than Swanda in Oklahoma City. The resume of this firm's activities (page 24) reflects the phenomenal growth of this city of the Southwest plains.

★  
This year—1938—marks the beginning (so many forecasters tell us) of a period when the year 'round residential air conditioning system really gains public interest and acceptance. The installation described on page 26 is, we feel, typical of the best 1938 thought.

★  
Resistance welding of ferrous and non-ferrous sheet metal calls for an intimate knowledge of welding practice. Especially welding of galvanized iron, coated metal sheets, and thin gauges of all types of sheet. Part 2 of E. I. Larsen's article, on page 29, is strictly to the point.

★  
Some months ago a reader asked for a pattern and a fabricating procedure for a half round gutter to be placed around a tower. We could find nothing suitable in the standard texts so Mr. Neubecker has worked out an original pattern (and a very clever one, we think) which we publish on page 32.

★  
Some readers never look at the Table of Contents page of any magazine. We, ourselves, are inclined to thumb through the pages first, looking at the illustrations, reading the titles, mentally selecting articles most appealing for first reading. But for those methodical readers who do look first at the Table of Contents, we here call attention to this month's feature article "A Cooling Survey of Lincoln, Nebraska," page 37.

★  
We conclude in this issue the latest report on summer cooling from the Research Residence (page 56.) The conclusions of this interesting investigation are highly important to contractors doing residential cooling. The investigation shows that an acceptable job of cooling can be done with equipment undersized according to our earlier ideas.

★  
And we also conclude on page 61 our catalog survey of ways and means of making attic fan systems quieter, more efficient, more satisfactory to the home owner.

# AMERICAN ARTISAN

With which is merged

**FURNACES  
SHEET METALS**

AND

**Warm-Air  
Heating**

Covering All Activities in

Gravity Warm Air Heating      Forced Warm Air Heating  
Sheet Metal Contracting      Ventilating  
Air Conditioning

J. D. Wilder, Editor

A. A. Kennedy, Assistant Editor

Brewster S. Beach, Consulting Editor

Vol. 107, No. 8

August, 1938

Founded 1880

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## THE AIR CONDITIONING SECTION

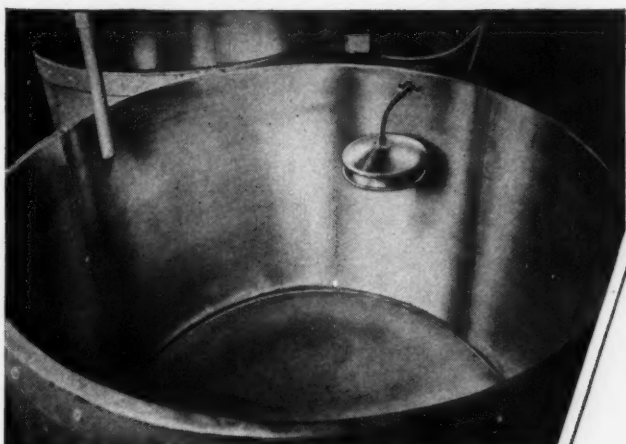
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**More than 8,000 Copies of this Issue are being distributed**



Close-up view showing interior of Monel maple syrup cooking and storage kettles. There are four kettles (shown below) all Monel-lined, 48" dia. x 36" high.

*This tough, corrosion-resistant metal is preferred for many kinds of food processing equipment.*

NEVER pass up a Cannery or Food Processing Plant. As you'll see by these photographs, not one but many places exist where tanks, chutes, hoods, tables, bins, hoppers, utensils, etc., need replacing and new ones added. These jobs are profitable, and will often come your way—if you only suggest Monel.\* For this reason:

Monel, as you know, is strong, tough, corrosion-resistant, and therefore long-lived—economical to use. But your smart Food Plant or Cannery executive demands something more. He demands a metal that not only resists the corrosive effects of food products—but which does not contaminate his product.

Right there is your opportunity: For Monel, long famed for protecting pure foods, is extensively used for food processing, handling and packaging equipment of all kinds. Monel, furthermore, is advertised in leading Food Industry publications month after month the year 'round. So your prospects know Monel.

You've merely to suggest it in sheet metal form for such additional applications as tanks, pails, vats, trays and other utensils.

Next time you're near a Food Plant or Cannery, don't pass it by—step inside. Suggest to the superintendent additional uses for Monel that haven't occurred to him. Write for further information, and for complete working instructions. Address:

THE INTERNATIONAL NICKEL  
COMPANY, INC.  
67 WALL STREET NEW YORK, N. Y.

\*Monel is a registered trade-mark applied to an alloy containing approximately two-thirds Nickel and one-third copper. This alloy is mined, smelted, refined, rolled and marketed solely by International Nickel.



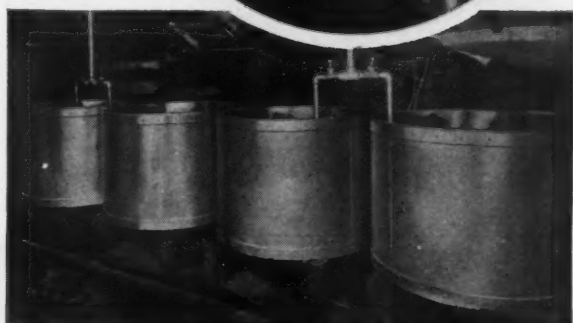
Before you  
Go Hungry for  
**JOBS**  
try selling  
**MONEL**  
to the  
**FOOD PLANTS**

(Below) Monel receiving tanks, three in all, 40" x 40" x 96" are set below the floor level. The removable trays are also made of Monel.

(Below, inset) View showing corner of the experimental filtration laboratory. Holding tanks, draw-off tank and filter trays are all of Monel.



Exterior plant view of The Maple Sugar Producers of Quebec, Plessisville, Quebec, Canada. Equipped with Monel storage tanks, processing tanks, filters, utensils, etc.



A nice job for any sheet metal worker—four Monel-lined cooking and storage kettles 48" dia. x 36" with Monel heating coils and floats.





# BIG, POWERFUL CLEAN-CUTTING

No. U-416  
16"  
\$3.00

Cuts curves as well as  
straight lines. Other  
models for every type  
of service.

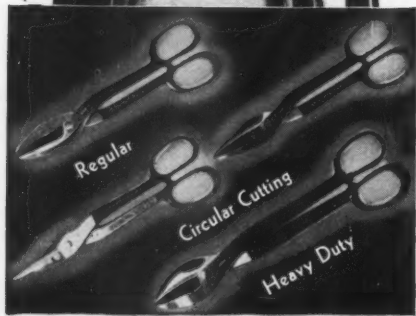
*and the  
price is  
Right!*

Big brother of Crescent's famous line of clean-cutting, punishment-resisting snips. No matter how hard "the going," here's leverage enough to make shearing easy.

U-416 will cut curves as well as straight lines. It has the same fine features of design and construction which characterize all Crescent Snips: solid forged blades that resist both use and abuse; blades *ground* to shape — not sprung; gently bevelled shoulders that make cutting easier through heavy metal; fine balance and comfortable hand grip.

Every tool kit needs this heavy-duty snip. Don't ruin lighter tools by overloading them when you can buy U-416 for so little. Fully guaranteed by us and sold by hardware stores, mill supply and sheet metal jobbers.

CRESCENT TOOL CO., Jamestown, N. Y.



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MAKERS

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It always pays you to specify J & L Galvanized Sheets for all your requirements. For J & L Sheet Products are strong and durable, yet their ductility gives them exceptional bending and forming qualities. Tightly coated, uniform to gage, these sheets permit difficult working without danger of splitting or fracturing. There are no warps, no uneven surfaces to hinder your operations — consequently, less chance of costly, time-wasting delays and rejects.

The superior quality of J & L Galvanized Sheets is the result of the rigid control under which they are rolled in J & L's modern 96-inch Continuous Strip Mill — and the highly developed galvanizing process with



which they are finished. The uniform quality of every shipment makes for more satisfactory finished products, and helps you increase your repeat business. Ask your distributor for J & L Galvanized Sheets.

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**J&L  
STEEL**

J & L—ALWAYS MAKING  
FINER CARBON STEELS FOR  
NEW AND BETTER USES

# BUILDING A BUSINESS YOU CAN *Bank on*



One way to show a profit on a sheet metal job is to quote an extremely low price and make it up by skimping on materials and workmanship. After all, many home owners know little about this kind of work. They do know, however, how it should look and wear and, once a customer is taken advantage of, it is next to impossible to get another order.

Successful shops . . . those which have been known a long time and have made money . . . recognize that customers are more interested in value than price. By recommending how to do

a job and explaining the wearing properties of different grades of materials, these sheet metal men show that they know their business and gain the confidence of their prospects. Once you have this, it is not difficult to get an order and make a friend.

Our business is much like yours. We can skimp on quality or hold it high. Because the trade knows that OSBORN value is one thing you can always "bank on", we have earned the confidence of thousands of customers. Through the years they have continued to help us and we to help them build our respective businesses.

A DEPENDABLE SOURCE OF SUPPLY FOR 79 YEARS

METALS AND METAL PRODUCTS  
FURNACES AND WARM AIR  
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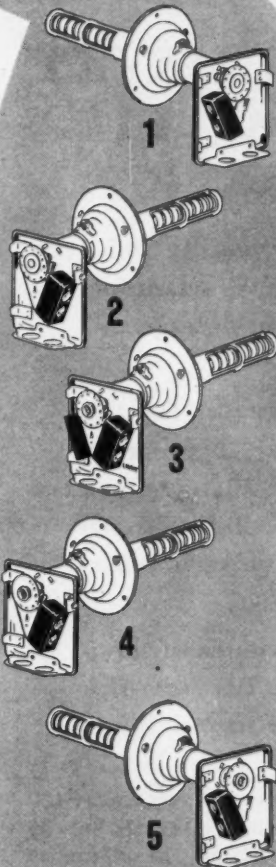
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*Modern*  
AS TODAY'S  
FURNACE PERFORMANCE



## 511 SERIES PENN FURNACE CONTROLS



**1. De Luxe Model Fan Control, Type 511x01.** (Interior view). A two-wire control, for installation in series with fan motor to prevent fan operating at low bonnet temperature; also to regulate fan operating bonnet temperature on oil or gas fired warm air furnaces.

**2. De Luxe Model Limit Control, Type 512x01.** (Interior view). A two-wire air control designed to shut down automatic heating equipment such as two-wire damper motors, oil burners, stokers, gas burners, etc.

**3. De Luxe Model Combination, Type 515x01.** (Interior view). Incorporates two separate single pole, single throw switching mechanisms, both actuated by the same sensitive bi-metal helix.

**4. Standard Model Fan Control, Type 511.** (Interior view). A single pole, single throw two-wire control for same furnace fan control operations as De Luxe Type 511x01. Adjustable only for cut-in point setting.

**5. Standard Model Limit Control, Type 512.** (Interior view). A single pole, single throw two-wire control for same applications as De Luxe Type 512x01. Has adjustment for cut-out point setting only.

### FAN CONTROLS, LIMIT CONTROLS, COMBINATION FAN AND LIMIT CONTROLS

Now you can specify a furnace control incorporating the famous, completely-enclosed Penn Magnesal contact unit, which has given such outstanding performance in other Penn heating and refrigeration controls. A complete line for all furnace control applications. Compact... sturdy... unusually attractive.

#### *Here are some of the important features of the Penn 511 Series*

Standard Penn Magnesal contact unit, which entirely eliminates pigtailed or flexible leads. Permits instant replacement of contacts in the event of damage due to abnormal load conditions. Positive snap action on both make and break. Completely enclosed heavy-duty contacts—rated for  $\frac{3}{4}$  hp. A. C. service to 250 V.

Convenient range adjustment on standard controls—both cut-in and cut-out points on Deluxe Controls, independently adjustable.

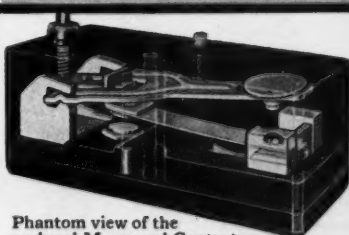
May be mounted in any convenient position with conduit connection generally downward.

Small, compact size. Unusually attractive appearance.

Exclusive Penn ball and socket mounting flange, permitting helix to be rotated to most desirable position in the bonnet in relation to uniform temperature and free air flow.

Metal guard over the temperature-sensitive helix to protect against accidental damage in handling and installing.

**PENN ELECTRIC SWITCH CO., GOSHEN, INDIANA**  
In Canada, Powerlite Devices, Ltd., Penn Electric Switch Division, Toronto, Ontario. Branches, Factory Representatives and Distributors in all principal cities.



Phantom view of the enclosed Magnesal Contact Unit, standard in all 511 Series Controls.

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Coupon*

for Bulletin WAL-1, giving complete specifications. We will also arrange for tests or inspections.

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Dept. H-5. Goshen, Indiana

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Photo by Ewing Galloway, N. Y.

## **AEROFIN WINS IN DANGEROUS SERVICE WHERE LIVES DEPEND ON COMPLETE RELIABILITY OF HEATING AND COOLING**

When men go down to the bottom of the sea, lives depend upon the precise functioning of every piece of vital equipment. In the United States Navy's submarine service, heating or cooling the under-water craft—quickly and efficiently, with equipment occupying the least possible space—is of paramount importance.

That is why Aerofin Standardized Light Weight Heat-Exchange Surface was chosen for the Government's new super submarines. Not only did Aerofin meet the rigid specifications of the naval architects and

engineers, but its proven reliability under exacting conditions was an important factor in its selection for this dangerous naval service.

You, too, can rely on Aerofin for the simplest or most complex heating or cooling problem. More than fifteen years of practical engineering research is behind the manufacture of Aerofin surface.

Take a leaf from the experience of thousands who have specified Aerofin with lasting satisfaction. Write to our home office or ask any of the district offices below for complete technical literature.

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Manufacturers  
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*Announcement!*



1/4 H. P. Split Phase Motor



1/2 Horse Power 3-Phase Field

*New* **CENTURY** Motor Insulation,  
with **SEVERAL TIMES MORE MOISTURE RESISTANCE**  
*than Ordinary Insulation... AT NO EXTRA COST!*

*Dampness* is the archenemy of all electrical equipment—because it soaks into the electrical insulation—causes breakdowns—resulting in shutdowns—*trouble* for you!

Increasing use of Residential Appliances installed in basements—new homes—wet concrete—dampness—long periods of idleness, when the motor “sweats” and accumulates moisture—all of these have multiplied the problem.

Century has produced a *brand new insulation* that increases the resistance to moisture many times over the old, ordinary insulation.

This new insulation will save your customers many shutdowns and make new friends for your products at no extra cost—if you specify Century Motors.

This is one of the most important contributions to the electrical appliance business! Have Century show you how this New Insulation prevents breakdowns!



**CENTURY ELECTRIC COMPANY**

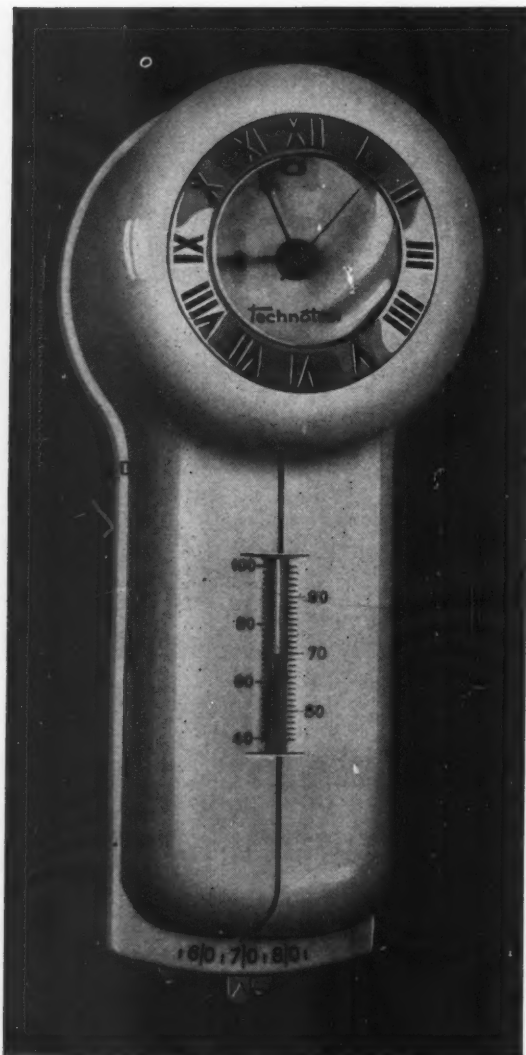
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# MASTER HEAT REGULATORS

give your customers the  
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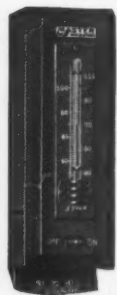
Furnished in Ivory or black molded cases, Technotrol combines distinctive beauty with a fine instrument of precision. Responsive to minute changes in temperature. Technotrol is available in either the Type C-22 two-position model or the famous Type C-144 gradual control model. Also furnished with snap action contacts for 2 or 3 wire low voltage control systems.

## TYPE B-22

### RELIABLE - LOW COST

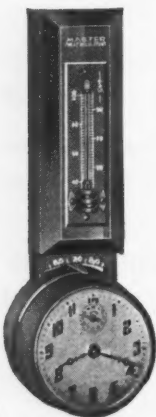
A MASTER instrument with the appearance, accuracy and reliability characteristic of the entire line. Priced for the greatest market of all—moderate salaried home owners. Has fine silver contacts, and 1 degree temperature range response. Motor is quiet with ample power to lift any damper.

In addition to standard line, we furnish quotations on regulators for special applications. We also manufacture the Type B-22-A and B-22-W Limit Controls.



B-22  
PLAIN MODEL

ONE-DAY  
CLOCK MODEL



B-22 MOTOR

*Well Built by Master Craftsmen*

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# THE STAGE IS ALL SET FOR A NEW STEEL FURNACE BY THE PIONEER BUILDERS OF STEEL FURNACES

The announcement of a NEW steel furnace is, in itself *something*, for the trend has been and is very definitely toward furnaces of steel construction. But when the pioneer manufacturer of the steel furnace industry announces a "brand new" product, built to quality standards which have been unmatched for over half a century, yet designed and priced to meet present-day conditions and competition, that's BIG NEWS to the Warm Air Heating Trade.

This announcement is all of that, and more—for 1938 has seen the culmination of plans which have been years in the making, and the new "P" Series WEIR furnace is the embodiment of everything that would be expected in a companion line worthy of the name that has always stood for the highest quality in the industry.

When it comes to price, here too the new "P" Series WEIR furnace will "shine," for no other manufacturer is better qualified by experience, nor equipped with better facilities to meet demands for greatest dollar value.

*With this newest addition, the already most complete lines—MEYER-WEIR—are more complete than ever—FOR ALL FUELS—as well as price range—and place the ONE EXCLUSIVE FRANCHISE DEALER in any community in an unbeatable position. To be THAT dealer in YOUR community, the first step is to write us—or simply use the coupon below.*

**THE MEYER FURNACE COMPANY**  
PEORIA, ILLINOIS  
"Who Makes It Makes a Difference"



**THE MEYER FURNACE COMPANY**  
PEORIA, ILLINOIS

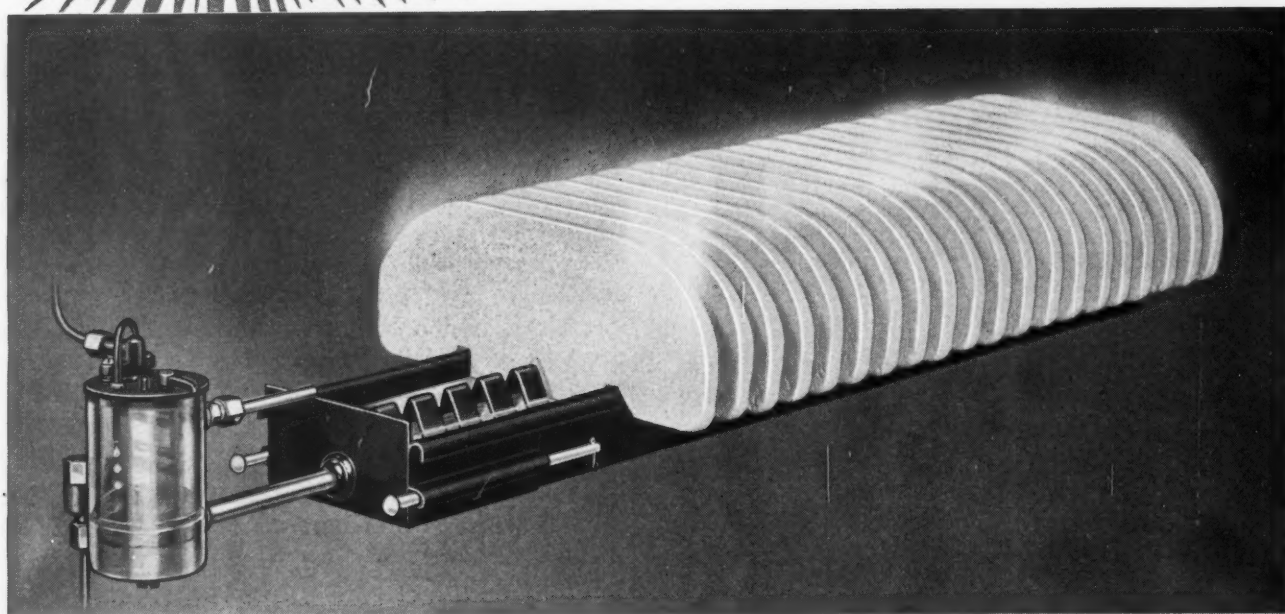
Tell us more about your new P. Series  
WEIR STEEL furnace.



Clip and Fill in, or attach the coupon to your letterhead for full information on the **NEWEST** steel Furnace by the **OLDEST** manufacturers in the industry . . .



# *new!* FLOTROL



## AUTOMATIC JUNE HUMIDIFIER

*Offers Unexcelled Advantages at a Popular Price*

**FLOTROL** → —the newest addition to the Automatic June line, compares favorably in price with any other humidifier of similar capacity, and it gives

**NEW CONVENIENCE** → —Water level of the evaporator is accurately shown in transparent control cup. Rate of feed is plainly visible. Can be instantly changed to meet varying weather conditions by resetting lever at top.

**NEW ACCESSIBILITY** → —No need to get inside the plenum chamber at any time. Control cup entirely records and governs water level and rate of feed.

**NEW COMPACTNESS** → —Each plate diffuses as much moisture as 50 square inches of water in an open pan. Control cup is only 2 1/8" in diameter by 3 1/2" high.

**NEW RELIABILITY** → —No lime can be deposited on inside of control cup to obscure visibility, clog the mechanism nor weight down float.

FloTrol sets a new high mark in humidifier values. With it you can give the home owner advanced humidification service at no increase in cost. Write for new descriptive circular and prices.

# MONMOUTH PRODUCTS, INC.

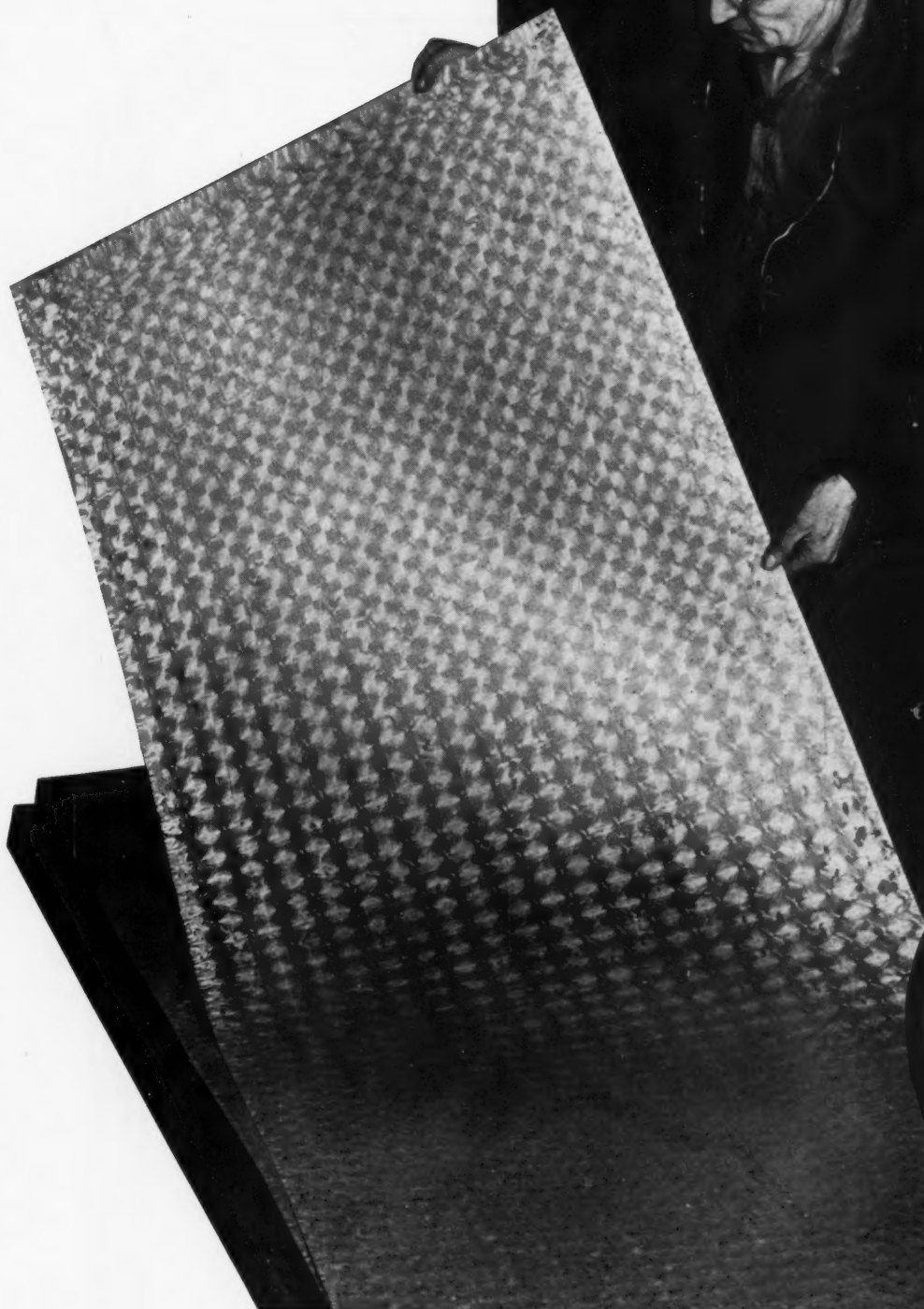
1933 EAST 61<sup>ST.</sup> ST. ★ ★ ★ CLEVELAND, OHIO

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● Latest edition to the SUPERIOR family of Galvanized Steel Sheets is SUPERIOR CHECKER COAT. With its distinctive bright spangles in pronounced blocks or squares, it has found immediate favor with Sheet Metal Workers who desire individuality in their products. There's a distinct newness about heating and air conditioning equipment or duct work when made of SUPERIOR CHECKER COAT Galvanized Sheets.

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**The Superior Sheet Steel Company**  
Div. of Continental Steel Corp.  
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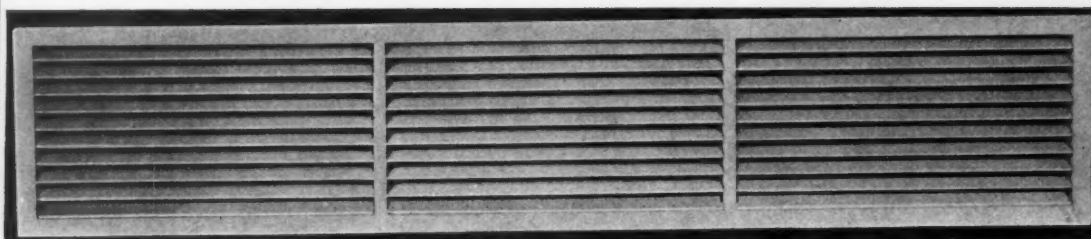
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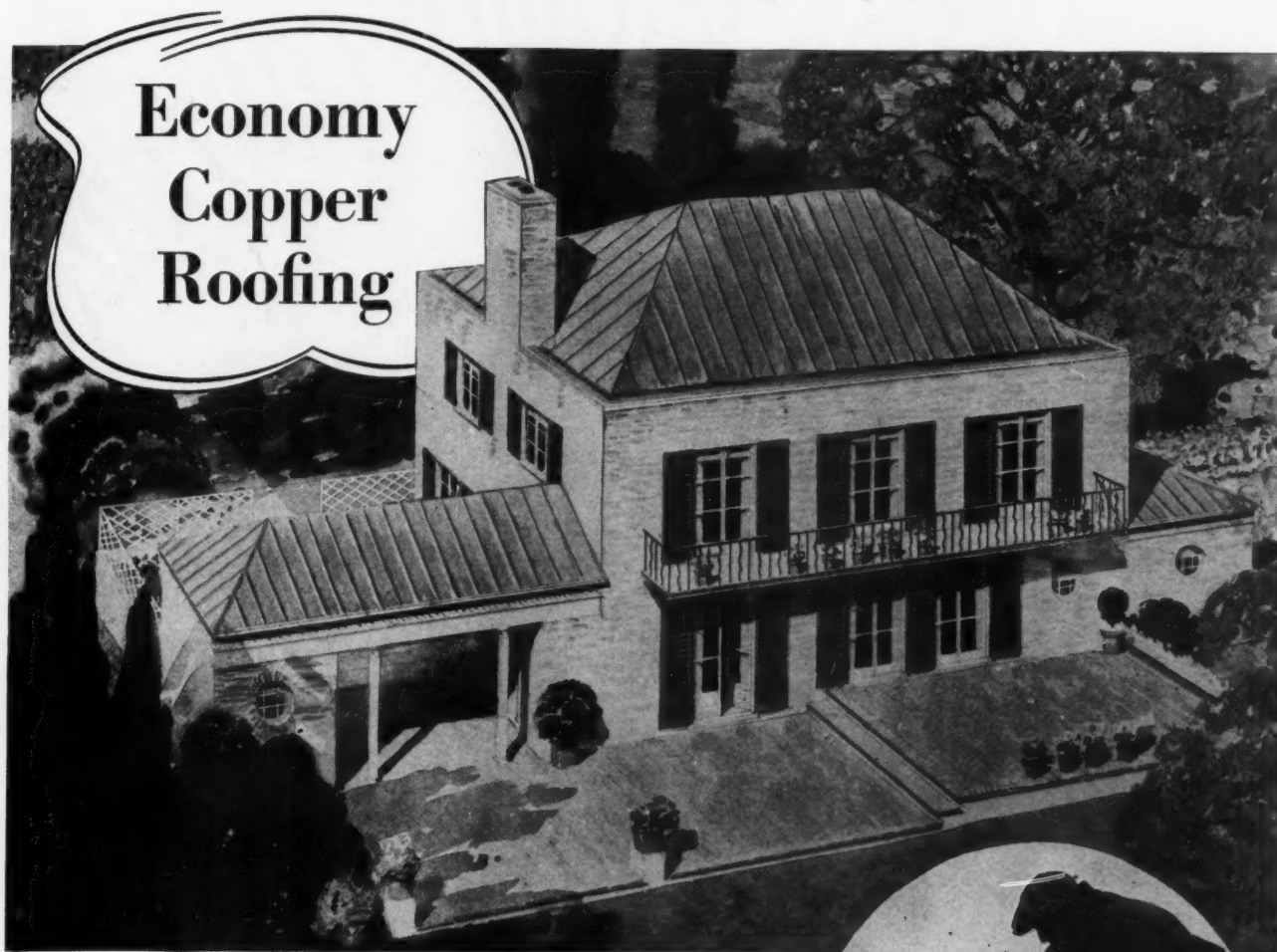
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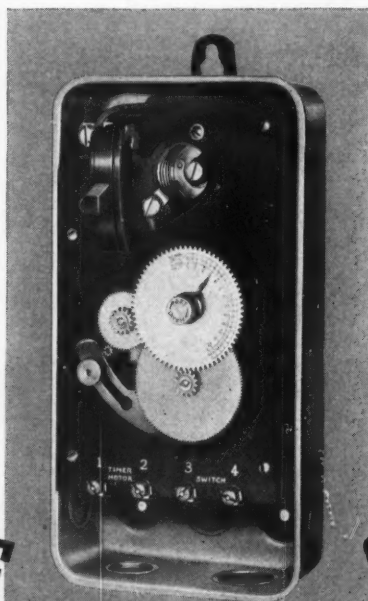
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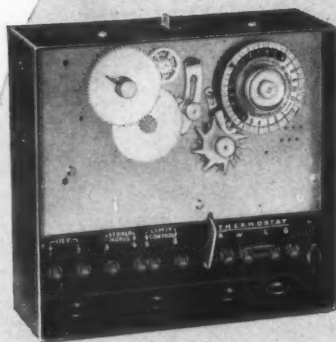
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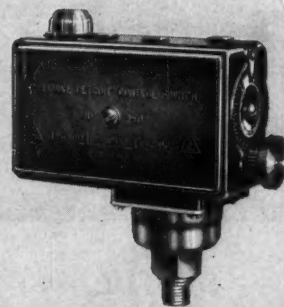
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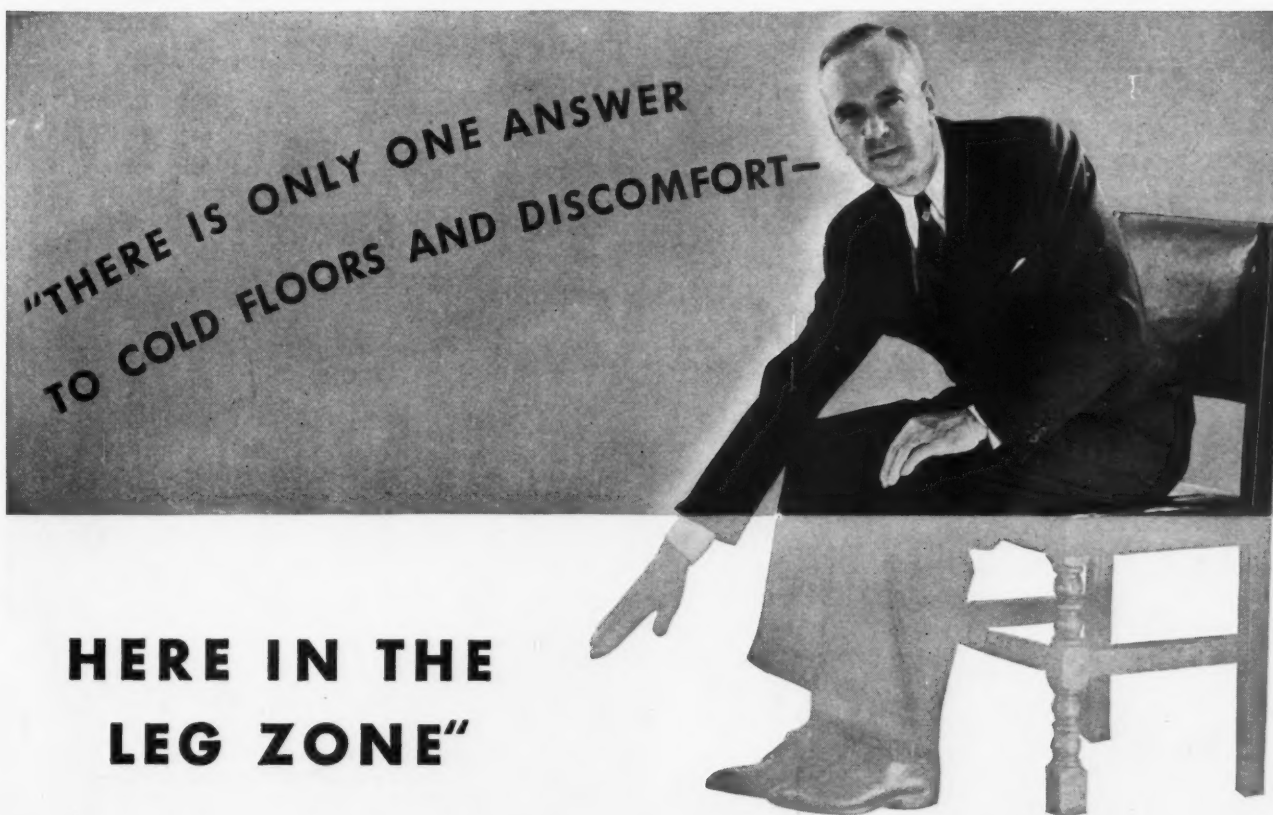


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Division of American Radiator & Standard Sanitary Corporation

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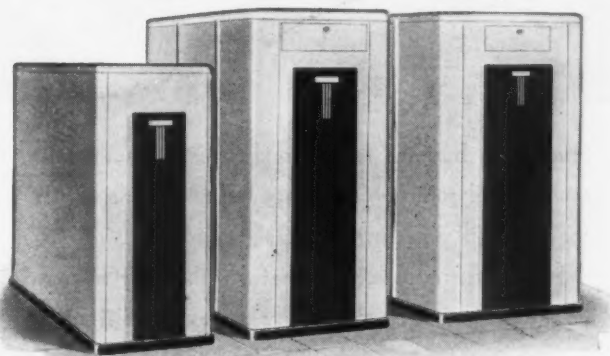
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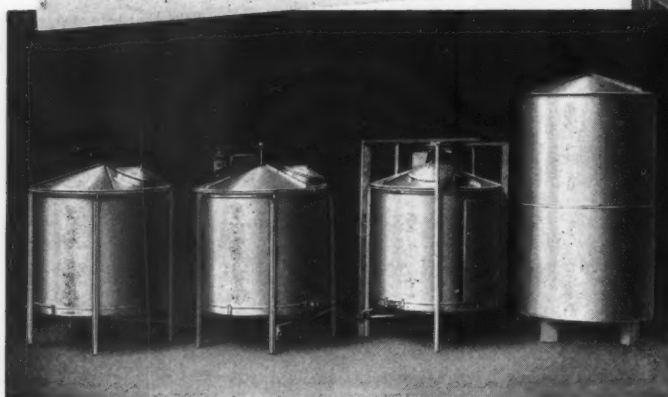
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CHRYSLER BUILDING, NEW YORK

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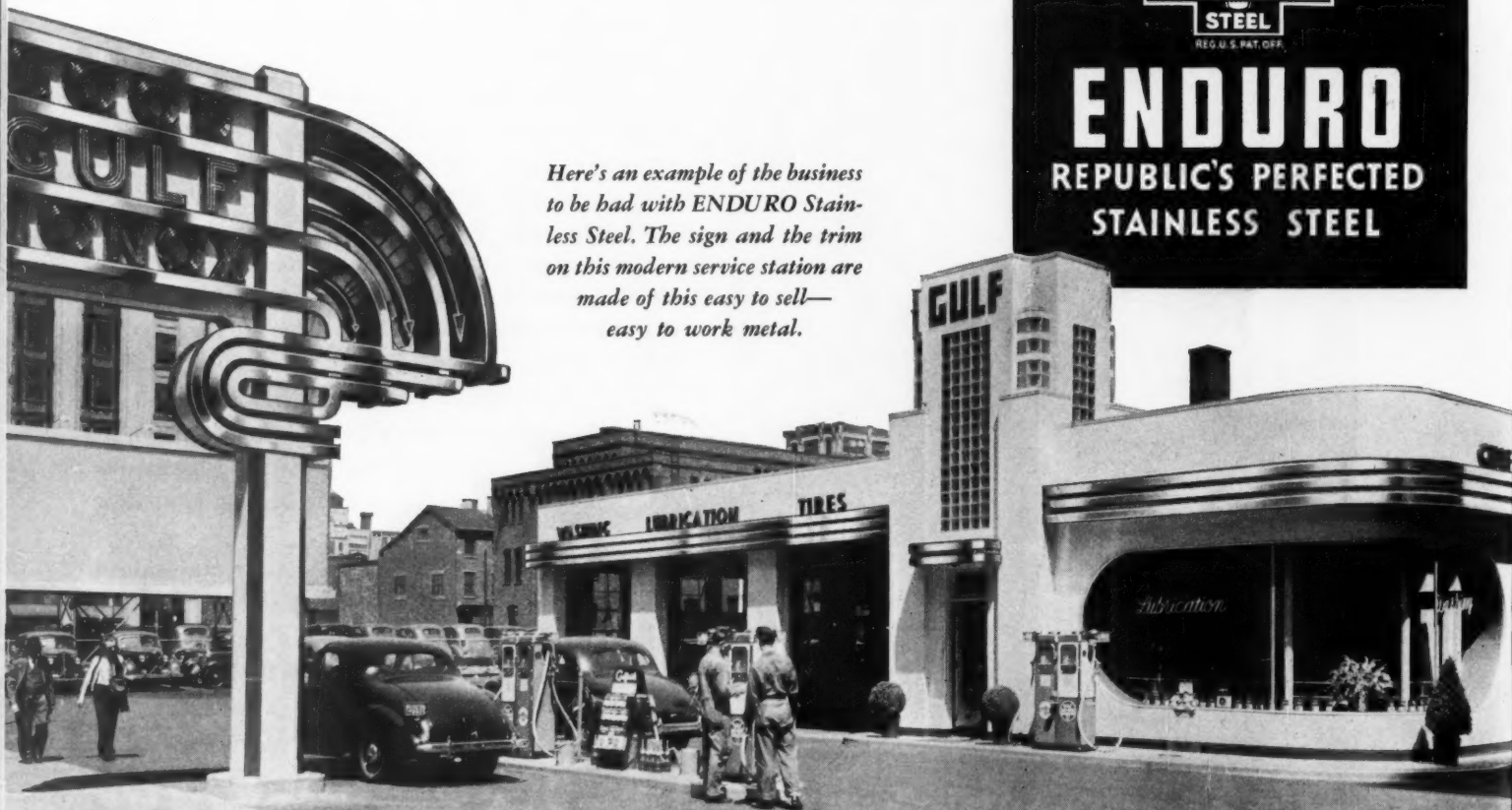
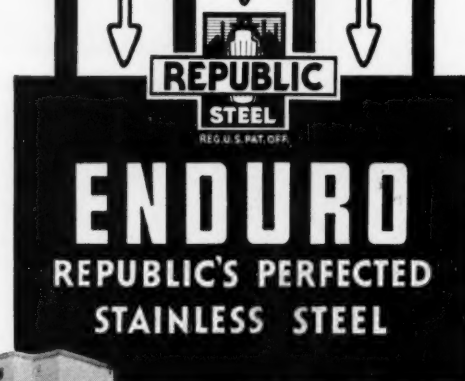
IF YOU HAVE ANY FEAR of working stainless steel . . . if you have been passing up profitable business because of this reason . . . banish that fear and go after more business . . . with ENDURO. This stainless steel perfected by Republic is as easy to work as it is to sell.

Other sheet metal contractors are profiting with ENDURO. Its beautiful silvery lustre, long life, high strength, resistance to rust and corrosion, ease of cleaning, sanitation and immunity to foods make it highly desirable for business, institution and home . . . make it easy to sell.

ENDURO is stronger and tougher than ordinary steel . . . and, therefore, requires more power and certain precautions in working. But . . . its high strength permits the use of lighter sections . . . and the greater profit realized more than pays for added precautions.

Any sheet metal shop with modern equipment will experience no difficulty in working ENDURO. Let us tell you what other shops are doing with it. Let us show you that ENDURO is as easy to work as it is to sell. Republic Steel Corporation, Alloy Steel Division, Massillon, Ohio—General Offices, Cleveland, Ohio.

*Here's an example of the business to be had with ENDURO Stainless Steel. The sign and the trim on this modern service station are made of this easy to sell—easy to work metal.*



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## STEEL



## AMERICAN

Volume 107



## ARTISAN

Number 8

Public  
Ignorance  
of A. C.

THROUGH the offices of the New York Herald-Tribune Institute, a service division of this newspaper devoted to home problems, there passed last year a total of 52,000 inquiries from 22,000 different people. Air conditioning loomed second in importance in the home owner's mind among all the problems relating to home ownership, management and maintenance.

Granting that the experience of the Herald-Tribune Institute with its readers and followers is but one example, it nevertheless represents a sizeable cross section of public reaction to the question of air conditioning and points to the necessity of the industry undertaking some sort of educational program among home owners, which will pave the way for a sounder development of the home market. Miss Dorothy Ducas and Miss Elizabeth Gordon, co-directors of the Institute, state the case as they see it after this fashion:

"From looking over the letters we have received during the past year, we would say that the most outstanding generalization is the fact that people don't seem to know enough about air conditioning even to ask specific questions. In general there is one guiding thought in the minds of people who want to know about air conditioning—how much does it cost? They do not seem to be acquainted with the idea of varying costs for different houses, nor even on the difference between complete air conditioning and winter air conditioning. Indeed, we find many people are not even sure about the difference between central air conditioning and one room cooling.

"People seem much interested in whether or not they will be able to open their windows with air conditioning. Many who do not distinguish between winter and summer air conditioning, seem to think that air conditioning imposes an obligation to keep all windows closed. Another source of confusion on the part of the readers seems to be where to turn for advice in planning heating and air conditioning systems."

Miss Ducas and Miss Gordon say that approximately half the inquiries they receive are from men, that more ignorance is apparent about winter air conditioning than summer, that air conditioning is synonymous in the public mind with "cooling."

Conclusions drawn by Miss Ducas and Miss Gordon as the result of their first-hand experiences with the Mr. and Mrs. Consumer is that air conditioning needs more and better interpretation if the full potentialities of the home market are to be secured.

Code of  
Minimum  
Requirements

THE buying public is now offered definite protection against the installation of air conditioning equipment improperly designed or installed to do the job expected of the system or represented to perform all of the functions of air conditioning when, in reality, only a partial service can result.

A "Code of Minimum Requirements for Comfort Air Conditioning," has been adopted by the American Society of Heating and Ventilating Engineers and the American Society of Refrigerating Engineers. The code sets up a uniform procedure for establishing the fundamental basis for the design of comfort conditioning installations.

In the making for more than two years, the code aims at establishing minimum design standards by which purchasers can judge the performance of equipment. While voluntary in nature, it is hoped the code will discourage sale of spurious apparatus under the guise that it is air conditioning.

For winter air conditioning, 70 deg. indoor temperature with 35 per cent relative humidity, when the outdoor temperature is 30 deg., is set as a minimum design standard. For summer air conditioning, an indoor design schedule of "effective temperatures" (which are an index of comfort based on a combination of temperature, relative humidity and air motion) is established ranging from 71 deg. "effective temperature" when it is 80 deg. outside to 75.5 deg. "effective temperature" when it is 105 deg. outdoors.

The code specifies the introduction of outside air for ventilating purposes at a rate of not less than 10 cubic feet per hour, per occupant, or not less than 15 cubic feet in premises where smoking is permitted, with removal of 95 per cent of ordinary dust particles to provide requisite air purity.

Air velocities which account for drafts and are a frequent cause of complaint in air conditioning systems, are limited to not more than 50 linear feet per minute, according to the new code. Control of air temperatures within 3 deg. at the five foot level or the "breathing zone" are also specified in the code.

Among previous points of controversy clarified in the new code are—Design Factors for Heating and Cooling; Source of Heat Transfer, Infiltration and Ventilation Rates; Air Distribution; Outside Air Supply and Quantity; Rating of Apparatus; Noise Control.

Limited copies of the code are available by writing the editors.





Two views of the new Swanda shop as viewed from the center of the floor. The new building is modern in construction and was planned and equipped around the day-to-day needs of a sheet metal shop.

## Swanda Has Served Oklahoma City Since Oklahoma was a Territory

**I**N 1903, Charles and Frank Swanda opened a sheet metal shop in Oklahoma City. Oklahoma, in 1903, was still a territory; two years before (1901) oil had been discovered in Red Fork, Sapulpa and Tulsa; the Indian wars were still a fresh topic; outlaws were a problem of the Federal courts; and the eight year's battle for statehood was nearing the half way mark. Oklahoma was the country's last frontier; the oil pool which soon thereafter gained world wide fame was uncharted Indian pasture; the state's first governor was four years in the future.

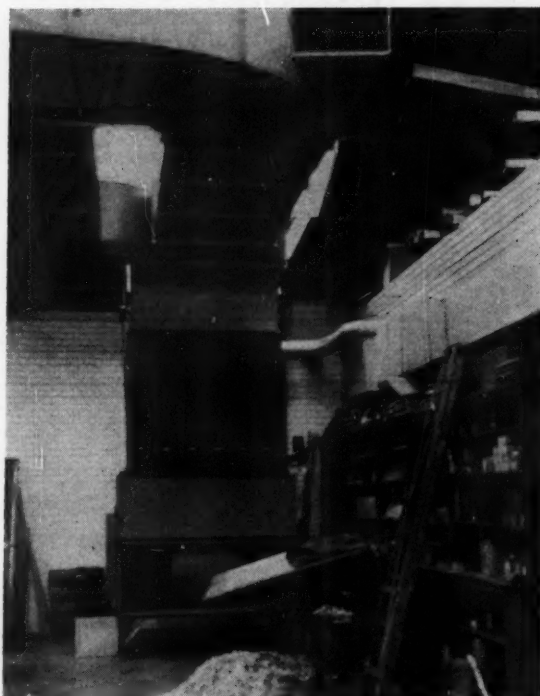
### Oklahoma City—1903

The Oklahoma City of 1903 had few physical earmarks of the city of today—a sleepy cow town with a single main street, very nearly described the town; towering office buildings were beyond the imagination; the wealth which oil was to bring was undreamed of. But then, as now, buildings needed roofs; houses and stores required heating; farmers and stockmen wanted culvert pipe, well buckets, water tanks; galvanized iron products like roofing tile and hip tile were popular—there was work for two pairs of busy hands skilled in metal craftsmanship.

The Swanda establishment of 1938, like the Oklahoma City of today, reflects the growth and expansion which thirty-five busy years have brought about. Where the first work was done in a small wooden building, today there stands a new brick structure 50 by 115 feet with its own dock on a spur track for unloading roofing and sheet metal material directly from the freight cars. In place of the first two pairs of busy hands, today 25 to 35

pairs of hands keep busy twelve months of the year. As more jobs in number or size are secured, additional mechanics are hired—the pay roll has frequently passed the 100 mechanic mark.

For the first dozen or so years sheet metal contracting constituted the bulk of the shop's work, but by 1922 roofing had expanded until 25 per cent of the business volume was roofing. To meet the varied demands of a state and a home city which

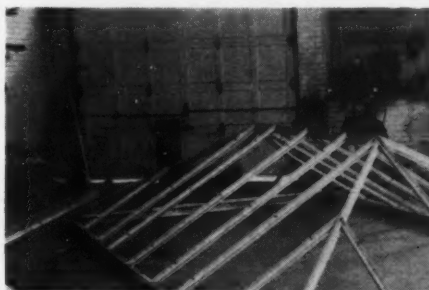


The Swanda shop and office is heated by a large Mueller, gas-fired, forced warm air furnace. Swanda sells this furnace in Oklahoma City.

was passing through a case of growing pains unprecedented in civic history, asphalt shingles for homes, built up roofing for commerce and industry, clay and terra cotta tile for towering office buildings, metal shingles and slate for buildings of all sizes and types, passed through the shop in ever increasing quantities.

Still the original sheet metal contracting and warm air heating expanded in proportion. From very unimportant beginnings, metal tile and hip tile grew to be a steady production item in the shop. Hip tile, for example, has been in production for more than 25 years. The dies were self designed, the machinery to stamp the tile was

To the right and below—skylights, ventilators, blow pipe sections, drainage items of standard Swanda fabrication. Industrial work has always been a backlog of work for this shop.



bought and replaced again, until at the peak of production more than 10,000 linear feet of galvanized iron hip tile was produced every month to find its way into the hands of lumber yards, carpenters, roofers and others. Galvanized iron roofing tile had its days of great popularity but fell into obscurity. Products of the shop like culvert pipe, water tanks, well buckets expanded and fell away under the inroads of the mail order houses, chain branch stores, specialists in these lines.

#### Some Heating History

With the coming of the oil wells, came gas. Plentiful, cheap, available everywhere in the Swanda trade area, gas was and is the preferred heating fuel. Gravity furnaces have been standard sales items of Swanda from the beginning, although for a time, heating was soft pedaled because large sheet metal and roofing contracts demanded the full attention of the entire organization.

But a few years ago forced warm air heating with gas emerged as the preferred heating system of local residents. Better and more expensive heat-



Above—Metal roofing tile as fabricated by Swanda for many years. At the left is hip tile of which Swanda fabricates some 10,000 feet in peak months.

ing systems began to replace the oftentimes sketchy heating systems of earlier years. With gas and forced air came better houses—houses with basements used for recreation—and with these better basements came the demand for rectangular duct work and skilled metal craftsmanship. This type of heating system and size of heating contract was made to order for the Swanda organization so, today, a fair percentage of all large residences enjoy this better type of heating installed by this pioneer firm.

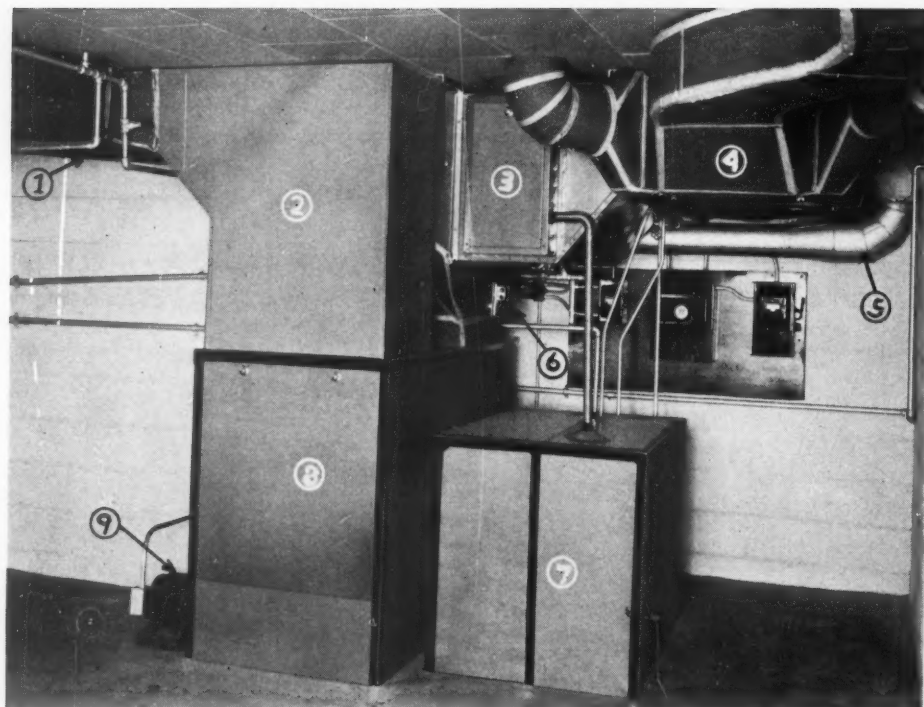
Hand in hand with better heating—and with the coming of wealth to Oklahoma City—has come summer cooling. Complete office buildings and smaller installations beyond quick count are cooled. Swanda sells no equipment, but the metal contracts of such installations as the J. C. Penny store and the Yellow Transit Company building in Oklahoma City; the Youngblood Hotel in Enid; the Southwest State Teachers College in Alva are Swanda jobs.

#### The Sheet Metal Backlog

As stated, the thread of work running through this firm's operations from the very beginning has been sheet metal work—outside sheet metal work, including the roofing. The Oklahoma City Municipal Building, Jail, Court House, publicized all over the country were Swanda contracts of 1936—incidentally, these three buildings used more than one-

(Continued on page 100)

## A System to Provide Year'Round Comfort



**A** YEAR-ROUND, residential air conditioning system of more than ordinary interest is graphically portrayed in the photographs and drawings on these pages. This installation is in the home of George B. Rooksby, Peoria, Illinois. The house was designed by J. Fletcher Lankton, architect, Peoria. The air conditioning system was designed by the Beling Engineering Co., Peoria, in conjunction with the engineering department of The Meyer Furnace Co. The installation was made by Heating and Sheet Metal Division of The Meyer Furnace Co., local dealer of The Meyer Furnace Co.

### A Typical 1938 System

This installation is interesting because it typifies the year-round air conditioning system incorporating all of the best engineering details of 1938. Several of these up-to-date details have been keyed on the photograph of the equipment. To itemize—the return air ducts and warm air supply ducts (numbers 1 and 4) where such ducts are exposed, have been insulated to reduce temperature drop in the heating season and to reduce air temperature increase in the summer cooling cycle. The furnace (8) and the compressor (7) have been attractively housed to reduce noise, eliminate dirt and

cleaning and to present a clean-cut appearance. The duct lining is Johns-Manville "Air-Acoustic"; the outside insulation is Grant Wilson "Dux-Sulation."

The return air system has been gathered together to form a compact plenum (2) minimizing the number of pipes exposed; the warm air main duct starts from a warm air plenum (behind the return plenum). The cooling coil (extended surface evaporator) for direct expansion of the refrigerant is compactly housed, out of the way, in an enlarged section of the single warm air main duct (3). And of some importance, but often ignored, the furnace vent for gas fuel is a lead-coated steel pipe (5) where exposed in the equipment room, connecting to a 7-inch Transite pipe furred into the ceiling of the basement hall and continuing between joists through the recreation room to the main chimney.

Additional features of interest shown in the drawings are—the drip pan with 1-inch drain pipe under the cooling coil to prevent floor muss (see detail A); the lining of return air ducts, warm air supply ducts, cold air and warm air plenums to prevent transmittal of all noise (see shaded areas on basement plan; use of approximately 15 per cent outside air for replacement and ventilation; use of fixed deflectors at all abrupt turns such as Detail B where basement mains

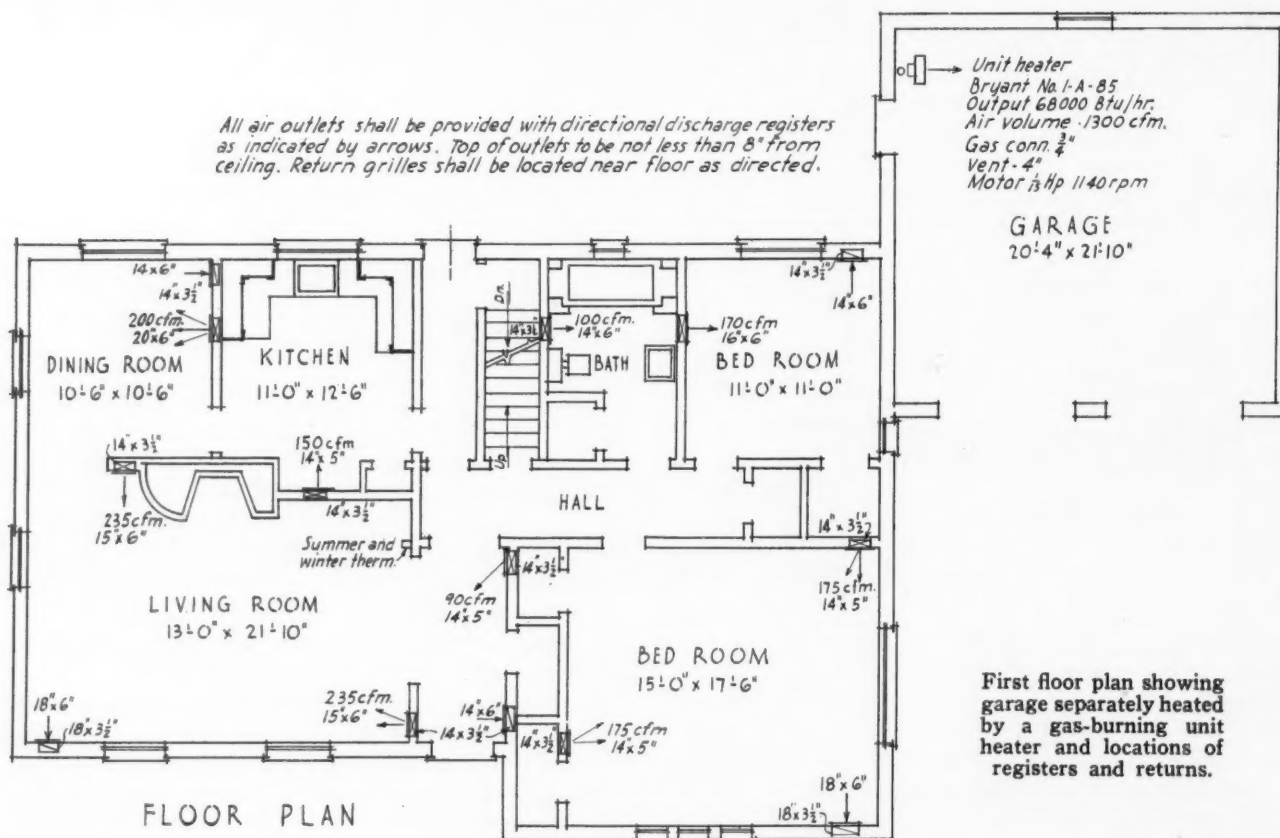
Right — Exterior of the house, showing type of materials.

Above — "Keyed" photograph of apparatus showing gas-fired furnace, housed compressor, cooling coil in duct, insulated ducts and general compactness of the installation.









exposed duct work. As noted on the plan, all branch pipes have volume dampers and splitter dampers for adjustment. The pipe lining (shown as shaded areas) is applied to the inside of cold and warm air plenums and is extended far enough out in each run to absorb any mechanical noise.

### Cooling

The same duct system and blower are used for cooling as for heating. The unit (motor-compressor-condenser) is housed beside the furnace and piped to the evaporator coil in the supply duct. This cooling coil has approximately 5.5 square feet of face area and under conditions of 82.7 dry bulb and 67.25 wet bulb will remove 35,880 Btu of sensible heat and 12,090 Btu of latent heat. The capacity of the compressor is just over 48,000 Btu per hour. The condenser requires 315 gallons of 65-degree water for cooling. All cooling apparatus is Westinghouse.

The distributing system for cooling has not been

designed for zone operation; the entire house must be cooled excepting as the owner closes off certain rooms or areas by means of the volume dampers in the branch pipes or the louvers in the registers.

During last summer it was found that the cooling system is capable of maintaining a dry bulb temperature at least 20 degrees below outside temperature. This indicates no need for zone cooling.

Minneapolis-Honeywell controls are used throughout the job. For winter operation the gas burners are controlled by a thermostat located in the living room, and in summer the compressor is controlled by a separate thermostat, also located in the living room. The controls are wired in such a manner that a manually operated summer-winter toggle switch located in the coat closet off the entrance hall can bring into operation either the summer or winter controls. In this manner, it is easy to switch from heating to cooling and back again during the spring and fall periods when both heating and cooling might be desirable on the same day.

## Pressure Losses in Air Ducts Due to Changes in Cross Section

The investigation described in Bulletin No. 300, "Pressure Losses Resulting from Changes in Cross Sectional Area in Air Ducts," by Alonzo P. Kratz and Julian R. Fellows, just issued by the Engineering Experiment Station of the University of Illinois, had for its object the determination of the losses in total head, or total pressure, otherwise called "shock loss," resulting from abrupt changes in the cross sectional area of an air stream, or occurring in various transition sections connecting ducts of different diameters.

Among the conclusions reached as a result of this investigation are the following:

(1) The shock losses in abrupt contractions are much smaller than those caused by abrupt expansions.

(2) The shock losses in diverging sections are dependent on the angle included between the sides of the section, the smaller losses occurring with the smaller angles; and the loss with an included diverging angle greater than 60 deg. is as great as that occurring with an abrupt expansion.

(3) The shock losses in converging sections are also dependent on the angle included between the sides of the section, the smaller losses occurring with the smaller angles; and the loss with an included converging angle of 60 deg. is less than that in an abrupt contraction.

Until December 15, or until the supply available for free distribution is exhausted, copies of this bulletin may be obtained without charge upon application to the Engineering Experiment Station, Urbana, Ill.

# Technique For Resistance Welding Ferrous and Non-Ferrous Sheet Metal\* [Part 2]

By E. I. Larsen  
P. R. Mallory & Co., Inc., Indianapolis

THE following sections cover the chemical composition, physical properties, resistance welding characteristics, electrode materials and strength of welded parts of the more important commercial alloys now being fabricated by resistance welding.

## A. Iron (Low Carbon Steel)

### a. Chemical Composition:

99 to 100% iron with small percentages of manganese, silicon, carbon, nickel, chromium, vanadium, molybdenum, etc.

### b. Physical Properties:

1. Electrical Conductivity—10 to 17%. (The conductivity depends upon the percentage of alloying elements present. For pure iron the conductivity will be approximately 17%.)

2. Melting Point—Approximately 1530° C.

3. Hardness—50 to 200 Brinell. (The hardness increases with carbon content percentage of alloying elements present and the amount of cold work.)

c. *Resistance Welding Characteristics.*—In the resistance welding of low carbon steel and iron the material is heated to the plastic range and the weld is effected by pressing the two pieces of heated material together. This is accomplished by the pressure on the electrodes. The pressure and temperature cause small deformations of crystals of the original sheets that will permit them to recrystallize. During the process of recrystallization the grains grow across the interfaces that separate the two sheets. This grain growth, therefore, is the fundamental phenomenon that welds the two pieces together. It is essential that the highest resistance occurs where the two metals are to be welded to each other. This resistance is closely associated with such factors as the quality of the sheet, carbon content, alloy content, surface conditions and the degree of oxidation of the surface of the sheets. In Table 6 the kva. required for the welding of smooth, clean, low carbon sheet are given.

For oxidized sheets the kva. should be increased approximately 25%.

Smoothness of the surface of the sheets has a great effect on the temperature required to produce a satisfactory weld. Esser has reported that polished sheets can be welded at a temperature of 960° C. whereas this temperature must be raised to as high as 1300° C. to obtain a weld of maximum strength on rough sheets. In these experiments the welding pressure was held

constant. If the pressure had been increased on the rough stock the weld could have been effected at a lower temperature.

In Table 6, pressures suggested are relatively light and do not reach more than 10,000 lb. per sq. in. when welding 120 spots per minute on 16 gage material. It should be understood, however, that these values are for clean, flat steel and that for scaly stock the pressure must be increased sometimes as much as 50%.

In general, the regulation of pressure can be covered by the following rules: (1) Pressure should be increased with shorter welding time; (2) the pressure should be increased with heavier stock; (3) the pressure should be increased with scaly or rough stock.

Steel can be welded at lower temperatures with high

Table 6

Gage	Spots per Min.	Kva. Required	Pressure
26	30	3	50 lb.— $\frac{1}{8}$ in. tip diam.
	120	12	90 lb.— $\frac{1}{8}$ in. tip diam.
24	30	4	60 lb.— $\frac{1}{8}$ in. tip diam.
	120	16	120 lb.— $\frac{1}{8}$ in. tip diam.
22	30	4.5	70 lb.— $\frac{1}{8}$ in. tip diam.
	120	18	130 lb.— $\frac{1}{8}$ in. tip diam.
20	30	5	80 lb.— $\frac{1}{8}$ in. tip diam.
	120	20	150 lb.— $\frac{1}{8}$ in. tip diam.
18	30	6	140 lb.— $\frac{1}{8}$ in. tip diam.
	120	24	220 lb.— $\frac{1}{8}$ in. tip diam.
16	30	10	175 lb.— $\frac{1}{8}$ in. tip diam.
	120	40	275 lb.— $\frac{1}{8}$ in. tip diam.
14	30	15	220 lb.— $\frac{1}{4}$ in. tip diam.
	120	60	300 lb.— $\frac{1}{4}$ in. tip diam.
12	30	20	275 lb.— $\frac{1}{4}$ in. tip diam.
	120	80	500 lb.— $\frac{1}{4}$ in. tip diam.
$\frac{1}{8}$ in.	30	30	280 lb.— $\frac{1}{4}$ in. tip diam.
	120	120	550 lb.— $\frac{1}{4}$ in. tip diam.
$\frac{3}{8}$ in.	20	50	450 lb.— $\frac{1}{4}$ in. tip diam.
$\frac{1}{4}$ in.	20	100	600 lb.— $\frac{1}{4}$ in. tip diam.

pressure or at higher temperatures with low pressure. Laboratory tests have shown by raising the temperature from 915° C. to 1250° C. the pressure required at the higher temperature is approximately one-third that necessary at the lower temperature.

Spot welding becomes increasingly difficult as the thickness of the plate increases. As mentioned before, temperature and pressure are the important factors in welding, the latter causes deformation of the material while hot and therewith facilitating recrystallization which is the basic principle of resistance welding. The thicker the two sheets the more the total pressure will distribute itself over the surface of the contact of the two sheets without being concentrated in a definite area where the weld is to be made. It is assumed that the greatest portion of the current flows only where

\*Paper presented before American Welding Society in Cleveland, Ohio, October 21, 1936.



the sheets are in intimate contact. It can be readily seen that in the case of thin sheets the surface of the contact will be approximately the same as the electrode area and the current density will be high. As the sheet thickness increases the current density will drop off rapidly due to the increase in surface contact between the sheets and rather high currents will be necessary to make a good weld. Such currents increase the current density in the electrode and melting or burning may occur at the electrode point.

In connection with the selection of the proper pressure and current, accurate timing is suggested because it will greatly decrease the wear of the electrodes and will produce a more uniform weld. Excessive heat is to be avoided because it will tend to cause the formation of large columnar grains which are inherently weaker than fine equi-axed grains. Excessive heat also produces a brinelling effect, causing reduction of the cross section of the welded area.

*d. Electrodes.*—Hard, copper base alloy electrodes are almost universally used for the welding of low carbon steels. Alloy electrodes give from three to twenty times the number of spots possible with the now out-moded pure copper electrodes.

*e. Strength of Welded Parts.*—In sheet thickness up to  $\frac{1}{16}$  inch the strength is approximately 90% that of the original material. In heavier thicknesses, for example  $\frac{1}{4}$  inch, the strength ranges from 60 to 80% that of the original material provided the proper welding conditions are used.

If the carbon content is above approximately 0.3% the sudden heating and cooling during the welding operation may cause hardening effects and therewith embrittlement of the welded zone and area adjacent to the welded zone.

Welds made in high carbon steel should be properly and carefully annealed. By using rather long welding times with relatively low current values the effect of annealing may be simulated to some extent. In general, however, it has been found that high carbon steels cannot be successfully fabricated by spot welding.

## B. Stainless Steel

### a. Chemical Composition:

- (1) 18% Chromium  
8% Nickel  
Small percentage of manganese, silicon  
Balance—Iron
- (2) 13% Chromium  
Small percentage manganese and silicon  
Balance—Iron
- (3) 15 to 18% Chromium  
Small percentage of manganese and silicon  
Balance—Iron
- (4) 25 to 30% Chromium  
Small percentage of manganese and silicon  
Balance—Iron

### b. Physical Properties:

- (1) Electrical Conductivity—2 to 5%
- (2) Melting Point—1400 to 1480° C.
- (3) Hardness—150 to 400 Brinell

*c. Resistance Welding Characteristics.*—The stainless steels generally used are those containing 18%

chromium and 8% nickel. This material is used in the cold-worked condition in which the tensile strength is approximately 150,000 to 200,000 lb. per sq. in. If this material is heated above a critical temperature range, that is, approximately 900 to 1500° F., the strength is decreased to approximately 90,000 lb. per sq. in. If it is held for an appreciable length of time between 1100 and 1400° F. carbides will precipitate and material lose its resistance to corrosion and fatigue and to a large extent its ductility and resistance to impact. Exposure to these temperatures for times as short as one-half second may be detrimental under certain conditions. In order to minimize carbide precipitation and retain the high strength resulting from cold work it is necessary that very large welding currents be applied for extremely short periods of time. By thus eliminating the time of the application of heat the period of dwell of the heat within the material is made less than that which would impair the desirable characteristics of the welded portions.

The pressure used should be relatively high in order to insure good point contact and insure the desired rapid heat conduction from the interior of the weld out through the electrodes. The electrodes of course should be water-cooled in order to carry heat away as rapidly as possible. The pressure applied may be 50 to 100% above that used in the welding of ordinary steel. A good weld in stainless steel does not extend quite to the outer surface of the two adjacent sheets, its thickness being approximately from 50 to 80% of the total thickness of the two sheets being welded.

Two examples are given in Tables 7 and 8 to show the welding conditions used in the plant of a large fabricator of stainless steel.

Table 7

Gage, two thicknesses, each	0.010 in.
Diameter of electrode	$\frac{3}{16}$ in.
Area of resulting weld	0.00165 sq. in.
Total electrode pressure	75 lb.
Welding time	0.0083 sec.
Welding current	1472 amp.
Current density in welded area	894,000 amp./sq. in.

Table 8

Gage, two thicknesses, each	0.050 in.
Diameter of electrode	$\frac{3}{8}$ in.
Area of resulting weld	0.0143 sq. in.
Total electrode pressure	500 lb.
Welding time	0.0833 sec.
Welding current	4270 amp.
Current density in welded area	298,200 amp./sq. in.

*d. Electrodes.*—A hard copper base alloy is recommended for welding stainless steel.

*e. Strength of Welded Parts.*—As pointed out before, the strength of resistance welded stainless steel sheets is a function of the accuracy of welding. It is impossible to avoid some annealing of the cold work sheets and, therefore, the strength will be reduced somewhat. In general however, the strength can usually be maintained at a value above 80% that of the original tensile strength.

### C. Coated Steel

#### a. Chemical Composition:

##### (1) Terne Plate

Composition of Plate 80.25% Lead  
18.00% Tin  
1.50% Antimony

##### (2) Tin Plate

Composition of Plate: Pure Tin

##### (3) Galvanized Iron

Composition of Plate: Zinc

##### (4) Special Coatings

1. Chromium Plated Steel
2. Nickel Plated Steel
3. Copper Plated Steel
4. Steels with Non-Metallic Coatings such as: Light Enamels, Oxides, Carbon, etc.

#### b. Physical Properties:

##### (1) Core Material Steel:

Electrical Conductivity—10-17%  
Melting Point—1530° C.  
Hardness—100-200 Brinell

##### (2) Plate:

- (a) Terne Plate—consisting mostly of lead:

Melting Point of Lead—327° C.  
Boiling Point of Lead—1525-1870° C.  
Electrical Conductivity—8-9%  
Hardness—3-5 Brinell

##### (b) Tin Plate:

Melting Point—232° C.  
Boiling Point—2400° C.  
Electrical Conductivity—8%  
Hardness—40 Brinell

##### (c) Galvanized Iron (Zinc):

Melting Point—420° C.  
Boiling Point—905° C.  
Electrical Conductivity—28%  
Hardness—30-50 Brinell

c. *Resistance Welding Characteristics.*—All three types of coated steel can be spot welded. The coating metals become molten during the welding operation. The electrodes as well as the steel are therefore in contact with such metals as tin, lead and zinc while under pressure. Recent researches have shown that liquid metals will penetrate into solid metal under certain conditions. This penetration is, of course, a function of time and will not occur if the welding operation is relatively short. In most spot welding operations, therefore, little danger exists that liquid metals will penetrate into the sheet and cause embrittlement.

Because of the greater affinity of the coating material for the electrode metals the danger of intercrystallization penetration of the electrodes is much greater and it has been found that some electrode alloys are prone to such penetration. There exists also the danger that the liquid metals of the coating will form an alloy with the copper base electrodes. This will occur particularly if the welding face of the electrode gets hot. It is possible, for example, to dissolve a piece of copper by immersing it in molten tin or zinc, therefore, very effective water cooling should be used in the

welding of coated steels in order to keep electrodes as cool as possible because in that condition their tendency to alloy or to intercrystallization penetration is greatly decreased.

In the welding of light gage galvanized sheets holes are some times burned through the sheets even when low currents are used. This is usually due to the pressure being too low. The zinc coating not only melts but becomes gaseous and causes an arc. This can be corrected by increasing the pressure and making sure that the pressure remains on the work after the current has stopped flowing. It is possible to weld galvanized sheet without seriously burning the coating. Under favorable conditions welds having thick coatings of zinc still left on the outside surfaces are being made in production.

Comparatively high currents are usually required to properly weld galvanized steel. Short welding times are essential for minimum surface disturbances, these ranging from 4 to 8 cycles, based on 60 cycle current. The increase in current input for welding galvanized steel should be approximately 25% higher than for welding of cold-rolled steel.

### Terne and Tin Plate

If the proper welding procedure is used, Terne Plate and Tin Plate are relatively easy to resistance weld. Welders having sufficient capacity to weld cold-rolled steel are entirely satisfactory for the welding of Terne Plate and Tin Plate. Little or no trouble due to burning is experienced in the welding of these materials because of the relatively high boiling points of tin and lead.

Specially coated materials such as highly polished chromium plate, nickel plate, etc., are being welded to some extent. In welding these materials the same conditions prevail as in the welding of low carbon steel. It is often desirable to leave as little indication of a weld on the polished surface as possible. One method by which the polished surface may be protected from being marred is to use a large flat electrode against the polished surface and a dome shaped electrode on the other. The flat electrode should be polished so as to reduce surface marring to a minimum.

In the cases of steel having coatings which have relatively high electrical resistance, or which may be completely insulating, spot welding is difficult and special techniques are required such as increased pressure, increased voltage, removal of coatings, etc.

Inasmuch as the basic material of the above mentioned coated sheets is usually low carbon steel the same pressures can be used as are applied for welding steel.

d. *Electrodes.*—Alloys having high electrical conductivity and high hardness have been found to be suitable for welding coated sheet steels. Hard copper base electrodes are recommended.

The electrodes found most suitable for welding galvanized sheets have a spherical or ball point welding face and are generally classified as dome tips. More frequent dressings are required as compared to clean, mild steel. In dressing the electrodes the use of emery

(Continued on page 96)

# Half Round Circular Gutter

By William Neubecker

Head Instructor,

Sheet Metal Department, New York Trade School

A CORRESPONDENT from California writes:

"I have contracted a job to furnish and install sheet metal work on a large residence.

"One room is a den 17 feet diameter and is specified to have a 4-inch, half-pound, single bead gutter of 24-gauge Armco galvanized iron with 6-inch apron. The pitch is 18/12.

"Will you please send any information you have showing how this gutter can be made without snipping the sides and soldering."

The plan submitted by our correspondent shows a circular wall 17 feet in diameter, around which a 4-inch, half round gutter is to set, with a 6-inch roof flange as indicated in diagram X, inserted within the plan view. This gutter can be made by means of flaring blanks which are "raised" and "stretched" with the raising and flanging hammers respectively.

The writer would suggest that 16-oz. cold rolled copper be used instead of galvanized iron, because the "raising" and "stretching" of the flaring blanks are apt to mar the galvanizing and loosen the zinc coating.

## Developing the Pattern Shapes

Fig. 2 shows how the various flaring blanks are laid out. Using *A* as center with a two-inch radius describe the semi-circle or the profile of the half round gutter as shown from 1 to 4. At the proper roof angle draw the roof flange 1-*B* as shown.

Parallel to the wall line drawn the line *H-R*, representing the center line, at a distance of 8 ft. 6 in. All this is laid out direct on the shop floor, striking chalk lines where required. Have the corner 1 in the half round gutter in its proper position on the wall line as shown. Now space the half round gutter in three divisions as shown by 1-2, 2-3 and 3-4.

For the pattern for the roof flange 1-*B*, extend this line until it intersects the center line at *C*. Using *C* as a center with radii equal to *C-B* and *C-1* draw the arcs *B-D* and 1-*E* respectively. Then will *D-E-1-B* be a partial net pattern for the roof flange or apron.

To obtain the pattern for the back of the gutter 1-2 (which will require *stretching*) apply the following rule. Draw a line from 1 to 2, bisect it and obtain point *a* from which a line is drawn at right angles to 1-2 to meet the curve of the gutter as shown. Through this point of intersection draw a line parallel to 1-2 as shown by *G-F* which should be equal to the girth of the curve from 1 to 2. Now extend *G-F* until it intersects the center line at *H*.

Using *H* as center with radii equal to *H-F* and *H-G* draw the arcs *F-H* and *G-J* respectively. Then will *F-H-J-G* be the partial net pattern for the back.

For the pattern for the bottom of the gutter which will be raised draw a line from 2 to 3. Bisect it and obtain *b*, from which drop a vertical line to meet the curve of the gutter as shown. Through this intersection draw the line *I-J* parallel to 2-3, and equal in

length to the curve from 2 to 3. Extend the line *J-I* until it intersects the center line at *K*. Using *K* as a center with radii equal to *K-I* and *K-J* draw the arcs *I-L* and *J-M* respectively. Then will *I-L-M-J* be the partial net pattern for the bottom section.

The front of the gutter will also be "raised" and as its pattern shape will be flaring, the following rule should be used for obtaining the radii with which to strike the pattern shape. Draw a line from 3 to 4, bisect it and obtain point *c* from which draw a line at right angles to 3-4 to meet the line of the curve at *d*. Bisect *c-d* and obtain *e*. Through *e* draw a line parallel to 3-4 and on this line lay off the girth of the arc from 3 to 4 as shown by *P-O*. Extend *P-O* until it intersects the center line at *R*. Using *R* as center with radii equal to *R-O* and *R-P* draw the arcs *O-T* and *P-S* respectively. Then will *P-S-T-O* be the partial net pattern for the front of the gutter. To facilitate "raising" and "stretching" cut all patterns from 4 ft. lengths or 8 ft. cut in two.

To all patterns excepting the bottom allow edges or laps for riveting and soldering as indicated in Fig. 3 where laps are shown with the flow of the water. Note the offset of the laps, which gives a clean, smooth surface on the outside. This offset is obtained by running the finished hammered mould through the "thick edge machine."

## Raising and Stretching the Flaring Blanks

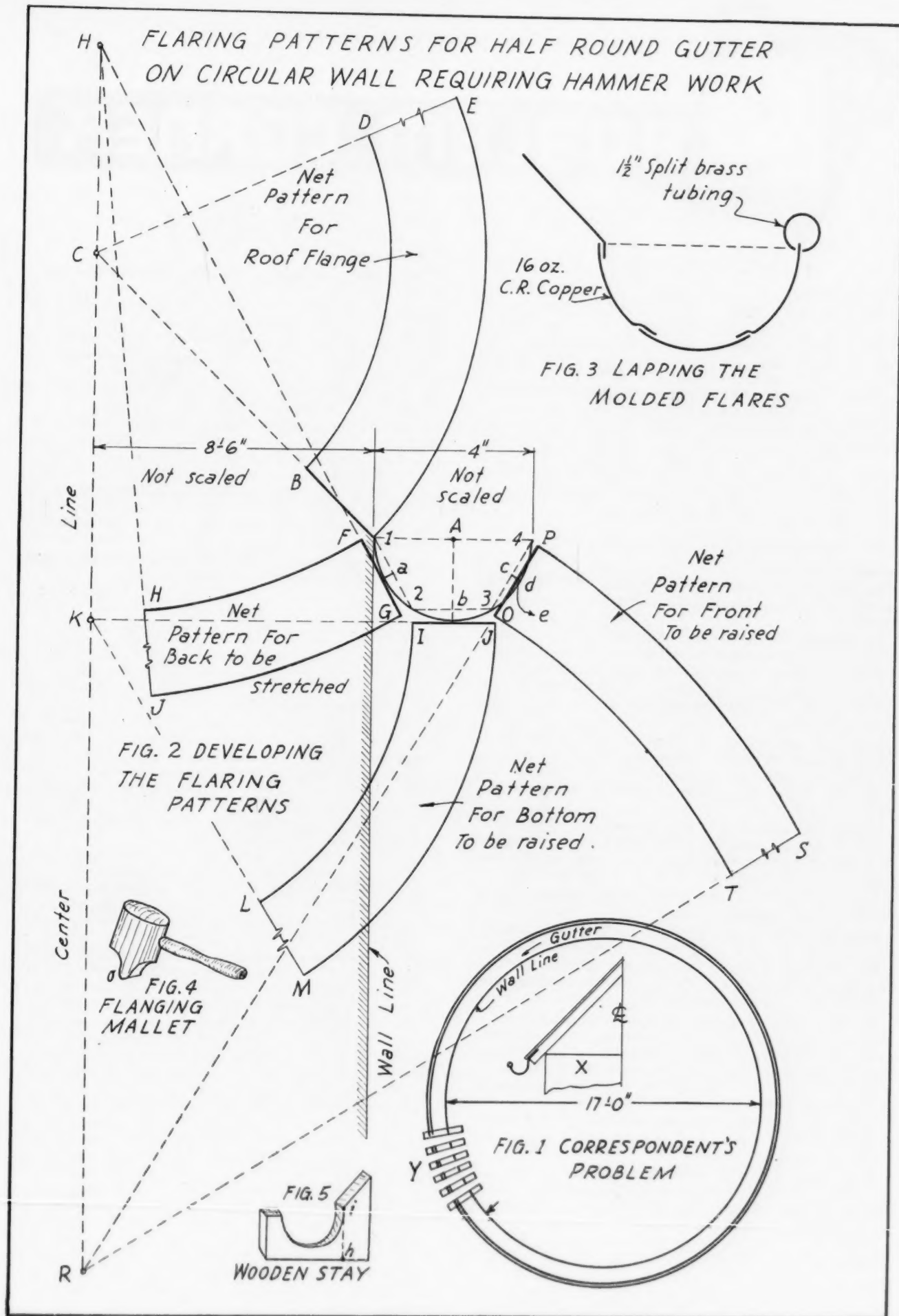
The front and bottom of the gutter will be "raised" with the proper size raising hammer on a lead block or tree trunk, in which an impression is made with the raising hammer to correspond to the curvature of the wall and the gutter profile. The back of the gutter is "stretched" on the blow horn stake, using the peen *o* of a hardwood mallet cut to the shape in Fig. 4.

When "raising" and "stretching" the various blanks a "stay" or profile must be used so that the flares will have the proper shape and curvature. This is accomplished by cutting a few wood "stays" as shown in Fig. 5, with the corner *i* projected down to *h*. These wood stays with the intersection *h* on same are set upon and nailed to the curved wall line struck with an 8 ft. 6 in. radius on the shop floor as shown in Fig. 1 by diagram Y which indicates six stays secured to the four foot long curved wall line.

## Assembling the Finished Moulds

Into these wood stays shown at Y in Fig. 1, the various moulded sections of the gutter are placed and tacked with solder, after which they are removed and the various lapped joints, riveted and sweated with solder. Three of these four foot lengths of gutter, can be joined together in 12 ft. lengths, always using the curved wall line in Fig. 1 as a guide in joining these three sections.







Your comment or experience is invited.

## PROBLEM CORNER

### July Chimney Problem

American Artisan:

With reference to the inquiry of F. W. S., New Jersey (the reader asked advice on constructing a new chimney to replace one too small) we wonder why someone on your staff did not suggest an induced draft fan. The present chimney could probably be placed in good condition and an induced draft fan and static pressure control purchased and installed for about one-third the cost of a new chimney and would produce positive results regardless of outside weather conditions.

N. E. Stilphen  
Stilphen Engineering Co.  
Sanford, Maine.

### November Dirty Furnace Problem

American Artisan:

In your problem corner of the November, 1937, issue, the question of dirt passing through warm air registers was discussed.

The problem installation was illustrated and certain suggestions were made. A check-up shows that all warm air registers are placed 6 feet above the floor, except the register in the living room. A further study of the system also indicates that the warm air registers are in most cases placed in corners.

The walls and ceiling no doubt are the spaces being soiled, although the person stating the problem does not say so. He does state, however, that all registers pass dirt except the living room register, which is the baseboard type.

I believe an inspection of this system would reveal that the air leaving the registers placed near the ceiling does so at a higher velocity than that leaving the living room register and that the system really is not passing dirt.

Inspection of various dirt complaints has revealed one of two things and sometimes both.

First, the registers placed high in the wall were entraining room air to follow along with that from the registers. Since the room air does not pass through the filters it naturally carries foreign matter such as dirt which, when it strikes the walls or ceilings, adheres to them.

The use of directional flow registers which will direct the warm air downward is always advisable for installations where the registers are placed near the ceilings. Where they are placed in corners, the air should be directed away from the walls and, if high in the walls, both downward as well as vertical deflections should be used.

Second, loose fitting registers and loose fitting stacks permit basement dirt to flow into the rooms around the risers and around the registers.

If the riser opening to the basement is not caulked and the register does not have some kind of gasket to tightly seal the opening, basement dirt will flow by gravity around the outside of the riser and thus enter the room.

When the blower is in operation this dirt is then syphoned into the air stream and distributed over the room.

C. L. Grandstaff  
192 Longfellow Ave.  
Elyria, Ohio

### Crackage vs. Air Change

American Artisan:

The problem is: the crack method versus the air change method. Several times in the last few months I have checked the losses of certain houses by the crack method and by the air change method and have found a wide discrepancy in my figures. The losses calculated by the air change method ran a great deal higher than the losses by the crack method. I was prompted to check my figures in this way because the houses chosen seemed to have a greater heat loss than the figures indicated.

In general, the heat loss ran 15-20% higher when calculated on an average air change of 1.5 changes per hour than when they were calculated on an average infiltration of 24 C.F.H. per foot of crack. Many times this means a larger unit must be used if the house is calculated on the air change method.

Is the crack method absolutely reliable for estimating infiltration losses or should a liberal percentage of the calculated heat loss be added to the heat loss figures to take care of this discrepancy which I experience?

E. T. W., Mass.

### Reply by The Editors

We believe that the crackage method for determining the volume of air leaking in or out is much more accurate than the so-called air change method.

The air change method is not new. It is included as a table in the original mechanical heating code, the figures being derived from the ASH&VE Guide. The Guide, in turn, got its figures from Harding & Willard, which text book in turn used Professor Carpenter's original figures on infiltration by air change.

Harding & Willard say that the air change method is simple, but frequently leads to absurd results and I believe you will find that the Guide and the Code caution users to apply common sense to air change method.

It is obvious that any such general method must be based upon average conditions and can not make any allowance for the condition of the sash or frame or cracks or number of windows in a wall.

With this in mind, we believe you will agree that a higher loss of 15 to 20 percent by the air change method is not at all surprising. Further, we note in your letter that you are using 1.5 air changes, which is for rooms with two sides exposed as compared to 24 cubic feet per hour per foot of crack, which is for a weatherstripped double-hung wood window. The actual comparison, we think, should be  $1\frac{1}{2}$  air changes compared to 40 c. f. h., which is an unweatherstripped window of  $\frac{1}{8}$  inch crack.

If you are willing to take the time to inspect the windows and do the necessary multiplication, we suggest that the crackage method is by far the best. On the other hand, if your total heat loss is arrived at by short cut methods, we believe the air change method is much simpler and quicker.

As to reliability of crackage method, the original table of heat loss, which is now Table IV in the new Code was formulated from windows erected in the laboratory and subjected to air pressure. These windows in turn were built with average cracks and clearances, based upon investigation of more than 600 actual windows. This would seem to indicate that the crackage figures are more than reasonably accurate.



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EVOTE

AMERICAN ARTISAN

# RESIDENTIAL AIR CONDITIONING SECTION

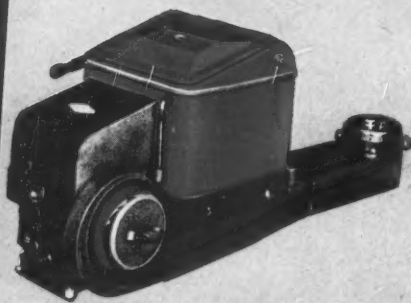
THE survey of cooling in Lincoln, Nebraska, published in this issue, is valuable, in our estimation, because the survey shows just what types of cooling, what sizes according to occupancy and the operating characteristics of all recorded installations in a typical city.

When it is remembered, as the text explains, that cooling really got under way in 1935 and that practically all the installations listed have been made in three years, we begin to visualize the extent of this market.

Lincoln is fortunate in having an abundant supply of cold city water. Most towns are not so fortunate and it is in these towns, we believe, that the sheet metal and heating contractor with a line of mechanical refrigeration apparatus will prosper most.

Because of the length of the survey, some customary articles have been omitted. These serials resume in the September issue.

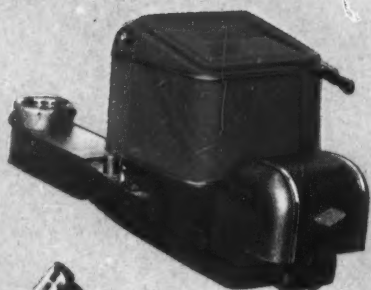
DEVOTED TO THE AIR CONDITIONING OF HOMES AND SMALL BUILDINGS



Stokol came into being with the perfection of the hydraulic transmission . . . a departure from gear-drive stokers. The hydraulic drive is standard equipment on 50 models of domestic and commercial Stokols . . . both bituminous and anthracite . . . hopper type and binfeeds . . . and streamline cabinet models.

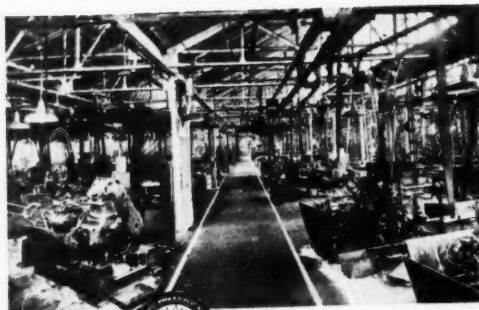
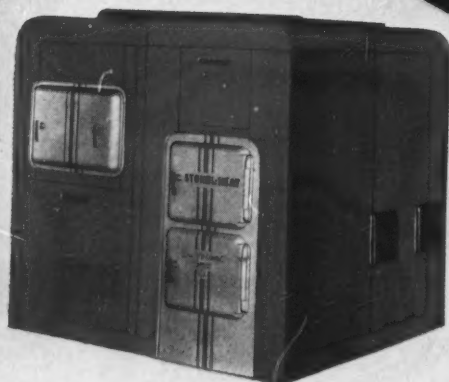
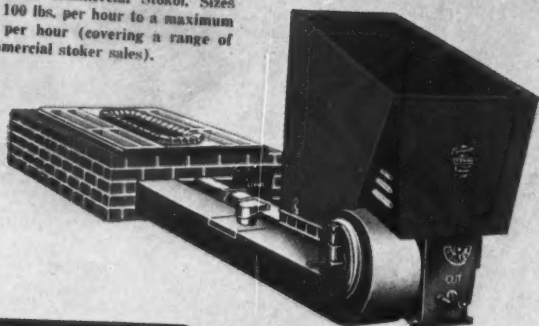


The Triplex Model gets its name from the simple, efficient, 3-step reduction worm drive. The biggest stoker value on the market at the price. Models to suit every home . . . hopper or binfeed. Covered by the Schwitzer-Cummins 2-year guarantee.



Domestic Anthracite Stokols, with or without automatic ash remover, are made with capacities from 15 lbs. to 70 lbs. per hour. Anthracite Stokol embodies all exclusive Stokol features . . . speed change lever, relief valve, automatic air control. Also binfeed models.

Thousands of apartments, hotels, hospitals, stores, churches and public buildings are heated with the commercial Stokol. Sizes range from 100 lbs. per hour to a maximum of 560 lbs. per hour (covering a range of 97% of commercial stoker sales).



STOKOL-HEAT

Every part of the Stokol and Triplex except the feed screw, electric motor and controls are fabricated in our own plants. Exclusive engineering features and modern manufacturing methods are necessary for the reliable and economical operation which the public expects today of a stoker.



## AN OPEN LETTER TO STOKER DEALERS

At the depth of the depression six years ago we entered the stoker business. We did this for two reasons: First—to provide work for the many hundreds of loyal and efficient employees who have given their best years in the service of this company. Second—we were convinced that the stoker industry offered a big field for the future.

We realized that a well designed product made by a competent company with modern manufacturing facilities, accustomed to quantity production, would find a ready acceptance with the public. So we designed STOKOL. Its success was universal. Since then more than 50,000 STOKOLS have been sold and are giving reliable service.

To provide our dealers with a wide variety of merchandise, a constant summer and winter business, we have added new models to the established STOKOL line. We perfected TRIPLEX, with the triple worm reduction, to enable our dealers to meet competition in the lower price field. Then to further broaden the dealer's opportunity we designed STOKOL-HEAT, a stoker-fired warm air conditioning plant of the most modern type. Other products include Blower Filter Units to modernize gravity warm air heating plants and a complete line of Ventilating Blowers.

Here then is a complete line of products for summer and winter sales, produced and guaranteed by a company of unlimited manufacturing facilities, engineering ability, strong financial background, which assure the dealer sales volume and permanency for the future. It is by far the most valuable franchise in the stoker industry today.

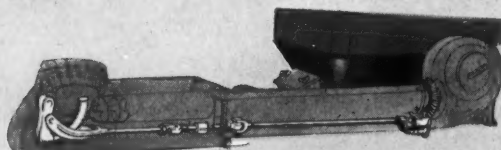
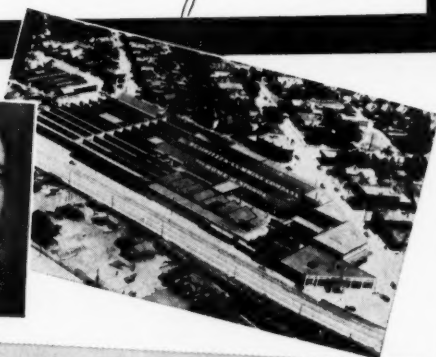
I would like you to know more about STOKOL and our other products. So I extend you a personal invitation to visit our modern plant. If this is not possible, may I send you an autographed copy of "Schwitzer-Cummins Company and Its Products?"

Very truly yours,  
SCHWITZER-CUMMINS COMPANY

*Arthur Schwitzer*  
President



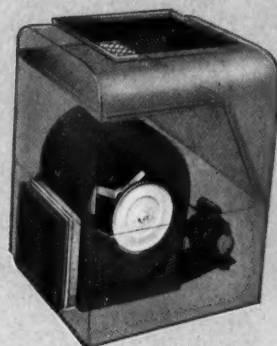
A definite policy of expansion presents a magnificent opportunity to dealers and salesmen to share with Stokol its success in automatic heat. Those who join with Stokol now will reap the greatest rewards.



The Stokol Retort Agitator makes it possible to burn grades of coal that cannot be burned in other stokers. The agitator prevents the formation of coke masses and coke trees . . . prevents the coal from sticking together by rolling and turning particles about. A light, flaky, even fire bed results.

Stokol-Heat is an advanced design of an automatic warm air heating plant and winter air conditioner, combining a stoker, forced warm air heating in an electrically welded steel furnace, air filtration and humidification, in one handsome compact cabinet . . . in either hopper or binfeed models. Sizes up to 300,000 B.T.U. per hour.

The Stokolair Blower-Filter, Hy-Duty Blower Filters and Home Ventilators for home or business, give Stokol dealers a popular priced line of products for summer and winter sales. Hy-Duty Blowers are made up to 15,000 C.F.M. in sizes from 10" to 25".

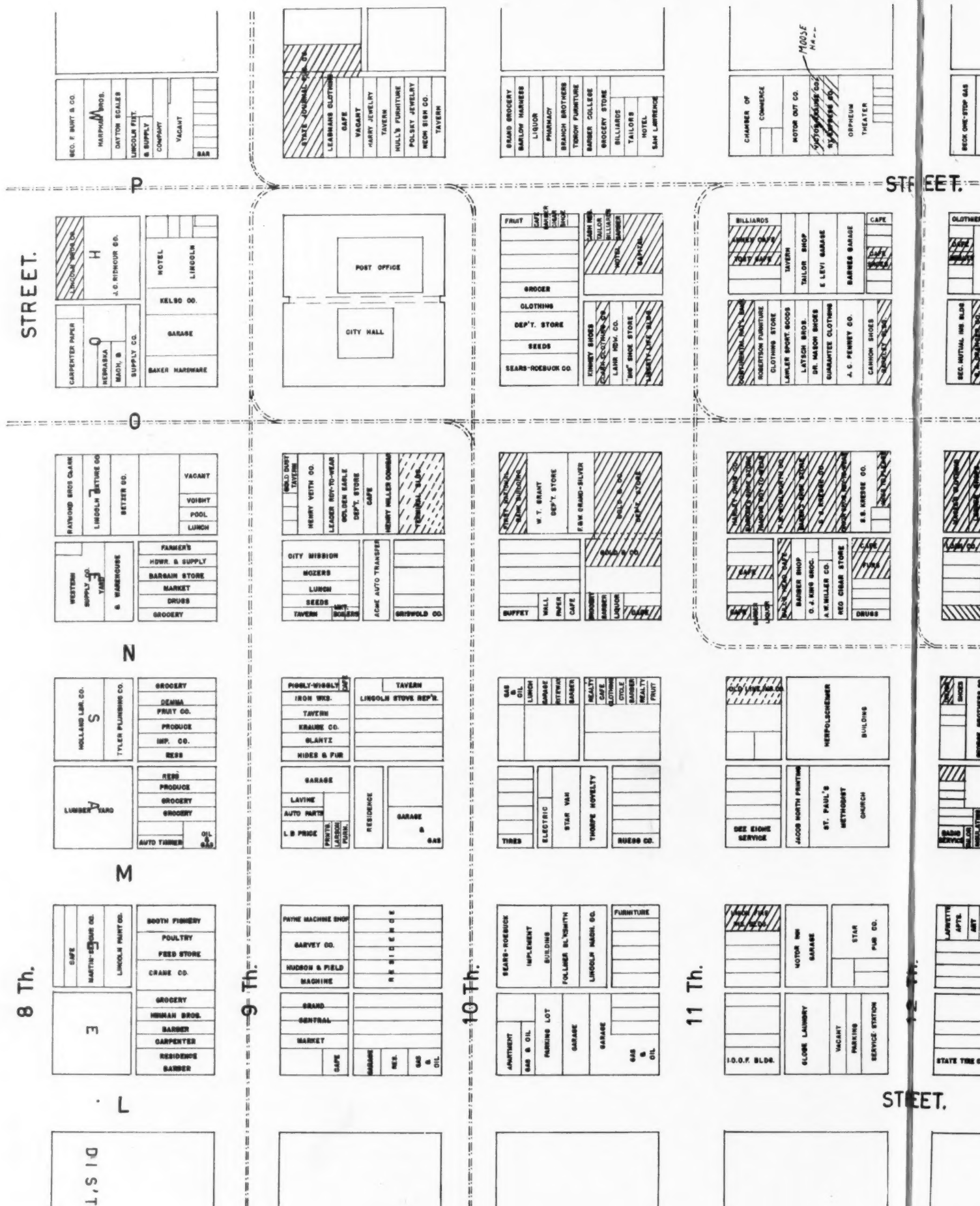




# A Cooling Survey of Lincoln, Nebraska



On following pages we present, we believe, the first complete, published survey of cooling installations in a typical city. Every installation, of which there is any record, has been included. The tremendous task of gathering data and preparing reports is the work of M. S. Tapley, Lincoln, engineer for Rudge and Guenzel Co., Lincoln sheet metal contractors.







## Lincoln—The Air Conditioned City

Last fall, on an editorial trip to the Southwest, a visit was paid to Lincoln, Nebraska, where, rumor had it, more cooling systems could be seen in a day's walking than in any city in the country.

Furthermore, an ardent booster for Lincoln as "The most air conditioned city size for size," had agreed to conduct a tour of proof. That booster was M. S. Tapley, who made this survey.

In company with Mr. Tapley we visited installations of every type, size and occupancy. In about four hours of walking (never more than five blocks from the Rudge and Guenzel shop) we inspected dozens of installations, in fact, we seemed to pop in and out of every doorway.

Arrangements for this survey were made during that visit. Since then, Lincoln has been singled out as the trial city for the "Sales Mean Jobs" campaign. The data gathered, the map prepared, the reports written, have taken months of time and a tremendous amount of effort. We salute Mr. Tapley.

Of interest to us was and is the large number of the installations fabricated and installed by Rudge and Guenzel Co., sheet metal contractors, for whom Mr. Tapley is engineer. Almost to the extent cooling has blanketed Lincoln, Rudge and Guenzel Co. has blanketed the metal work of cooling.

We present this survey with the hope that whenever customers ask—"How far has cooling spread?" an answer can be given from this data.

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# Tonnage by Fields of Application

	Total H.P. Installed as of Jan. 1, 1937	Total H.P. Added 1937	Total H.P. Installed as of Dec. 15, 1937	Remarks		Total H.P. Installed as of Jan. 1, 1937	Total H.P. Added 1937	Total H.P. Installed as of Dec. 15, 1937	Remarks
<b>RESIDENTIAL</b>					<b>RESTAURANTS</b>				
(Consisting of furnace fans, attic fans, small air conditioning units, etc., as listed by dealers.)					Central Hotel Cafe .....				
Green Furnace & Plumbing Co.....	20	20	40		Y. W. C. A. ....	12	..	12	
Airtemp Division, Sidles Co.....	20	30	50		Senate Lunch .....	12	..	12	
K. L. Bonebright.....	8	8	16		Forum Cafe .....	6	..	6	
Capital Heating Co. ....	2	2	4		Bull Head Coffee Shop.....	3¾	..	3¾	
Carrier Air Conditioning Co.....	25	22	47		Annex Cafe .....	..	30	30	
G. A. Crancer.....	50	—20	30	(a)	Bobs Coffee Shop .....	..	2	2	(†)
Iowa Neb. Light & Power Co.....	42	8	50		Beacon Coffee Shop .....	..	½	½	(†)
R. M. Wolfe .....	21	6	21	(b)	Yost's Cafe .....	..	6½	6½	
Payne Heating Co.....	50	30	80		Acme Chili Parlor.....	..	1½	1½	(d)
Swift Lumber & Fuel Co.....	7	14	21		Mayfair Grill .....	..	11	11	
Wentz Air Conditioning Co.....	10	0	10	(c)	Y-Not-Eat Cafe .....	..	5	5	
Rudge & Guenzel.....	50	20	70			72¾	56½	129¼	
	305	134	439		<b>PUBLIC BUILDINGS</b>				
<b>SHOPS</b>					University of Nebraska Coliseum.....				
Rudge & Guenzel Beauty Parlor.....	0	10	10			..	1	1	(†)
Mrs. Stover's Candy .....	½	3	3½	(g)		..	1	1	
Kindly Optical Co.....	0	5	5		<b>HOTELS</b>				
	½	18	18½		Capital Hotel .....				
<b>OFFICES</b>					Cornhusker Hotel .....				
Lincoln Liberty Life .....	99	..	99			8	32½	40½	
First National Bank .....	235	..	235			40	60	100	(c)
Woodman Building .....	72	..	72			48	92½	140½	
Lincoln Tel. & Tel. Co.....	10	13	23		<b>THEATERS,</b>				
Continental National Bank .....	30	..	30		Colonial Theater .....				
Iowa-Neb. Light & Power Co.....	..	..	..		Varsity Theater .....				
Stuart Building .....	..	552	552		Capital Theater .....				
Sharp Building .....	..	190	190		Stuart Theater .....				
School of Commerce .....	..	20	20		Lincoln Theater .....				
Neb. Central Building & Loan.....	..	8	8			10	..	10	
Barkley Building .....	..	39	39			12½	..	12½	
Farmers Mutual Insurance Co.....	..	5	5	(f)		15	..	15	
Dr. C. H. Arnold.....	..	10	10			135	..	135	
Hampes & Peterson.....	..	4	4			135	..	135	
	446	841	1287			307½	..	307½	
<b>STORES</b>					<b>MISCELLANEOUS</b>				
Gold & Co.....	161	..	161	(*)	Hodgman Mortuary .....				
F. W. Woolworth .....	..	..	57½		Wadlow's Mortuary .....				
Magee's, Inc. ....	..	..	40		Industrial installation consisting of blower and small water coolers— estimated .....				
Miller & Paine .....	292	..	292		Castle-Roper-Matthews Mortuary .....				
Baker Shoe Co.....	9	..	9			10	10	20	
Lincoln Drug Co.....	17	—10	7	(h)		10	..	10	
Lerner Shops, Inc. ....	..	12½	12½			20	18	38	
Harley Drug .....	..	11½	11½		<b>INDUSTRIAL</b>				
Kresges 5 to 25c Store.....	..	30½	30½		Nebraska State Journal.....				
National Recreation Parlor .....	..	½	½	(†)	Grainger Bros. ....				
Meier Drug .....	..	½	½	(†)	Swift Lumber & Fuel Co.....				
Orkin Bros. ....	..	2	2	(†)		27	7½	34½	
Clark's Clothing Co. ....	..	1	1	(†)		27	7½	34½	
The Famous .....	..	15	15		Total H.P. as of Jan. 1, 1937.....				
Cadwallader Fur Co. ....	..	7	7		Total H.P. Added 1937.....				
Ben Simon .....	..	..	..		Total H.P. Installed.....				
Howland-Swanson .....	9	..	9			1674¾	1221	3011¼	
	488	70½	616						

(\*)—Silica-Jel. (†)—Cooler only.

(a) An estimate of 50 hp was given last January but a recount of jobs installed showed only a total of 30 hp to date.  
 (b) R. M. Wolfe has discontinued handling the small unit coolers.  
 (c) Wentz Air Conditioning Co. are not merchandising blowers and air conditioning units. Their work has been mainly plumbing in cooperation with other dealers.  
 (d) Duct work is installed for year around conditioning, however, all that is connected at present is a blower. The compressor will be connected in the spring.  
 (e) The Cornhusker Hotel was reported last year as 40 hp actually there was 1-40, 2-7½ and 1-5 or a total of 60 hp installed prior to Jan. 1, 1937, and then 40 hp was added during 1937 for a total installed hp of 100.  
 (f) This job was installed in 1936, but not previously reported.  
 (g) Mrs. Stover's was originally installed as 3½ hp but was reported as previously as ½ hp.  
 (h) Lincoln Drug Company was installed as 7 hp but reported in error last year as 17 hp.

# Lincoln Installations by Occupancy

## Commercial, General

### Lincoln Drug Co.

THE Lincoln Drug Company, one of the oldest wholesale drug houses in the middle west, air conditioned their offices and display rooms in the spring of 1937.

The single air conditioning unit is hung from the ceiling in the shipping rooms; air is supplied to all parts of the conditioned space and discharged through high velocity outlets. Water is used for pre-cooling and direct expansion to continue the cooling and to dehumidify the air. The load is 8 tons, the water pre-cooling coils taking care of three tons and the compressor of the balance. The compressor is located in the basement directly beneath the air conditioning unit.

The fan is started and stopped manually and a thermostat controls the compressor.



### Lincoln School of Commerce

THE Lincoln School of Commerce operates 12 months of the year, and is thought to be the only school of its kind that offers its students the advantages of air conditioning.

The school occupies the second and third floors of a building 50 by 142 feet, three stories high. Enrollment is approximately 200. Mr. W. A. Robbins, the president, decided to air condition in the fall of 1936, and the installation was made during the winter vacation, between December 18 and January 4.

An air conditioning unit installed at the ceiling of the third floor, above the stairway, supplies air to both floors from this apparatus. Direct expansion, with water pre-cooling, is used to handle the load. The 15 hp compressor is installed in a closet on the second floor. After the completion of the installation, the owners decided to heat through the apparatus and use the water pre-cooling coil for heating in the winter.



### K. F. A. B. Radio Station

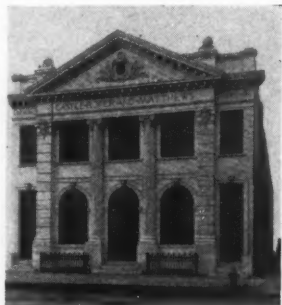
THE installation in this radio station cools the air in several studios. A system of ducts distributes the conditioned air through the rooms. The total cooling load is about 3 tons. Especial care had to be taken in designing and sizing the duct work so that no air noise would be picked up by the microphones.

### Castle Roper Matthews Mortuary

THE Castle Roper Matthews Mortuary installation is a "central station" type with the conditioner and compressor located in the basement. A duct system for air distribution serves the areas conditioned on the first floor.

The system is a "pre-cooling" type, in that a part of the conditioning is done by the 60° water available and the remainder of the conditioning is done by mechanical refrigeration. The "off" water from the precooling coil is utilized in the condenser, thus using the water twice.

The operating room is not conditioned by the main duct system, but is equipped with a separate, small, direct-expansion unit operated from the main condensing unit. In addition, an exhaust system has been installed.



### Farmers Mutual Insurance Co.

THIS building is 50 by 142 feet in area, two stories high. In 1935 a cooling system was installed with the 20 ton capacity water coil placed in the basement and ducts extending through the center of the main office and on to private offices and work rooms on the second floor. About 12,000 cfm of air are circulated. The system maintains 80 degrees inside at 110 degrees outdoors.

### National Recreation Parlor

THE National Recreation Parlor has one store air conditioner of the unit type, five tons capacity, blower of 2000 to 3200 cfm. A mixture of return and outside air is drawn into a return chamber over renewable air filters and a fin-type cooling coil. The blower is of low speed centrifugal type, driven by 1/2 hp. motor. Water is used as the refrigerant, however, the use of chilled water for cooling and hot water for heating has been recommended for the sake of economy.





**Continental National Bank**

**T**HE Continental National Bank has air conditioned the main floor banking room and offices; also, the safe deposit department in basement with a central system. The bank is a 30 hp. coil job on



two compressors, each 15 hp. Two fans are used, the one for the first floor being an 11,000 cfm unit. Pneumatic controls are used throughout.

**Lincoln State Journal**

**T**HE Lincoln State Journal has the first floor and editorial rooms conditioned for year-round comfort. The lower floor is cooled from a unit in the basement operated from two conditioners having a combined capacity of 14 tons. The unit also has heating coils and spray nozzles for winter operation.

The editorial rooms on the third floor are cooled from a unit suspended in one corner of the room,

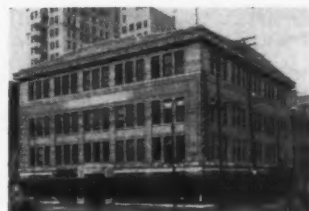
coupled to a 7-ton compressor in the basement. This unit also has heating coils and spray nozzles for winter operation. One feature is the fact that the system is in operation approximately 20 hours every day, but has given excellent service in the two years it has been installed.

The Journal is completing a new, two-story addition which is being cooled with water coils, with provision for the addition of direct expansion coils in the future. As the new addition will house presses and linotype machines, the cold Lincoln water will provide all of the cooling that will be necessary for this type of occupancy.

**Lincoln Telephone Co.**

**T**HE operating room of the Lincoln Telephone and Telegraph Company is air conditioned by a straight central station type system with a conditioner and 10 hp. Freon compressor, with an air distributing system. This installation is equipped with a complete set of automatic control equipment.

The entire building is now being air conditioned. Work will be completed by July 20th, 1938. (Report made in June.—The Editor.)



## Department Stores

**Ben Simon & Sons**

**T**HE Ben Simon & Sons store installed air conditioning in the spring of 1936. The basement, first, and second floors handle men's wear and furnishings; on the third floor is the ladies' ready-to-wear, and beauty shop.

One air conditioning unit is installed in the basement to take care of the basement and first floor; a second conditioner is located on the second floor; another on the third floor. The system uses water for pre-cooling, with direct expansion to continue the cooling and dehumidification. One compressor is on the third floor; one in the basement.

For winter heating and humidification, steam is supplied to all three conditioners.

Air is supplied to the first floor through a concealed duct running back of the balcony partition. Air is discharged through high velocity outlets circulating approximately three times as much air as is actually discharged. On the other two floors the ducts are run exposed along beams.

**F. W. Woolworth**

**T**HE Lincoln store of the F. W. Woolworth Co. is cooled by a central station system, installed on the second floor. Distributing ducts run along the ceiling of the first floor with outlets both ways. The return air grilles are cut through the first floor ceiling under



the fan. Outside air is taken in from a pent house on the roof.

The capacity of the compressor is 90 tons using Freon and a motor of 75 hp. The condenser is shell and tube type. The air is cooled by passing through a washer. In winter the air is heated by the same system using steam coils.

**Gold & Co.**

**G**OLD & Company completely air conditioned their store building with the exception of their stock room—approximately one hundred fifteen thousand square feet of space.

The installation was designed by Chas. S. Leopold of Philadelphia. After considerable study it was decided to install a Silica Gel unit. This was the first large installation of this type for department stores and the equipment was especially designed.

A deep well and pump were installed. These supply a sufficient quantity of saline water at approximately 59 degrees to cool the air after it has been de-humidified. The plant was so designed that the air intake would be on the roof and a steel and asbestos sheet penthouse was constructed on top of the building to house the Gel units and coils.

The conditioned air is delivered first to a large duct, then into separate circulating units on each floor; in some cases there are several independent ducts on one floor to take care of space with special uses. For example, the basement luncheonette, the basement sales space and the basement grocery department each have separate systems. This was done in order to eliminate any possibility of odors and to take care of the load in those several departments.

Each unit is equipped with thermostat controls for both winter and summer conditioning.

In the winter the same system is used for heating, with a circulating pump supplying hot water to the coils.

Auxiliary units are placed in the vestibules of the entrances to take care of extreme temperatures, particularly during the extreme cold weather. These supply heated air to these exposed spots.

**S. S. Kresge Co.**

**S.**S. KRESGE CO. air conditioned their Lincoln Store in 1937. The installation was designed for water cooling; refrigeration to be added if required.

The traffic in this store is very heavy. Available floor space for equipment could not be had so a pent house was erected on the roof of the one-story portion at the rear of building.



A deep well and pump furnish a sufficient quantity of water at approximately 59 degrees for the cooling coils and the air washer. A recirculating pump is used for washing, cooling, etc. The water is wasted through downspouts to the storm sewer. The fan moves 16,880 cfm.

Provisions were made in housing the equipment for future direct expansion coils; also, for heating coils.

Air distributing ducts are arraigned along and supported at the ceiling in the store. All ducts are insulated with insulating board. Recirculating grilles are located in the ceiling directly below the fan and manually controlled volume dampers are provided. Face and by-pass motor dampers are installed between cooling coils and air washer and in the fan circuit and fresh air inlets.

**Miller & Paine**

**M**ILLER & PAINE was one of the first department stores in the country to be entirely air conditioned—the installation being made in the Summer and Fall of 1935. Not only is the sales space conditioned, but the employees' locker room, cafeteria, shipping room, tea room, fur department, offices, candy manufacturing and fur vault are also air conditioned.

The fur vault and candy manufacturing departments have individual units to take care of the needs of the space. The balance of the building is conditioned by a central system with duct work distributing the conditioned air throughout the building. The sales space occupies approximately 100,000 square feet, the balance being made up in offices, shipping room, employees' locker room, etc.

The design conditions are 80° dry bulb with a relative humidity of 50% based on outside conditions of 95° dry bulb and 75° wet bulb and in the



winter time the basement and first floor are entirely heated by the air conditioning apparatus. On the balance of the floors the air is tempered and the heating accomplished in conjunction with direct radiation.

The total refrigerating load for this building is 290 tons. Since 60° water is available, the size of the refrigeration compressor is reduced by using the water first as a pre-cooler for the mixture of return and outside air; then as condenser water for the refrigeration machine. Fin coils are used as a pre-cooler and the water temperature rise through these coils is about 5°. Approximately 85

tons of refrigerating effect is secured by the pre-cooling; the balance of the refrigerating effect is obtained by a centrifugal machine driven by a 200 hp. motor. The city water pressure is sufficiently high to force the water through the pre-cooler coils as well as the condenser for the centrifugal machine, hence a condenser water pump is not required.

The centrifugal machine is a self-contained unit, with the cooler, condenser, compressor, gears and motor mounted on one base. The coolers and condensers are of the marine type with the water to be cooled and the water for condensing flowing through the tubes; the gaseous or liquid refrigerant is on the outside of the tubes. Since the refrigeration machine cools water direct, a pump is required to circulate the refrigerated water between the spray type dehumidifier and the cooler of the refrigeration machine. The refrigerated water is cooled to about 45°.

The main air conditioning apparatus, together with the Carrene centrifugal refrigeration machine, is located in the basement. Outside air is taken into the equipment at the first floor ceiling and mixed with return air at the basement apparatus room ceiling. The outside air dampers are divided into two parts—a minimum damper which allows the required outside air to enter the system for ventilation, and a maximum damper which is regulated by a dewpoint thermostat. In winter the outside air passes through two sections of pre-heaters, each section individually controlled to prevent freezing of the coils. The balance of the basement equipment is made up of pre-cooler coils, return air dampers, spray type dehumidifier, fans, motors, re-heaters and static pressure regulator and dampers.

The cool and dehumidified air is conveyed by means of fans to a dehumidified air riser which furnishes the cool, dehumidified air to floor control fans on each floor. The Auditorium System of air

conditioning is used, which automatically regulates the amount of dehumidified air and recirculated air to maintain the desired temperature conditions. An old spiral chute was removed and in its place the dehumidified air riser was installed. The floor control fans are suspended from the ceiling, hence none of the selling space on the floor is utilized for air conditioning equipment.

This type of system was used due to the availability of space in the basement for apparatus room, space for the dehumidified air riser, and the fact that individual floor control could be obtained. The particular advantage of this type of control is that the equipment will adjust itself to varying load conditions so that if a special sale occurs on one particular floor, the balance of the building can be individually controlled and the increased load due to the people can be taken care of on the particular floor on which it occurs without affecting the balance of the building. Then, too, the first floor can be kept a little warmer than the balance of the building to serve as a tempering zone.

The main apparatus supplies approximately 64,000 C.F.M. and the total capacity of the floor control fans is approximately 79,400 C.F.M. The air distribution is obtained through high velocity slotted outlets which produce an induced air circulating effect, circulating 3 cubic feet of air for every 1 cubic foot of air discharged through the outlets.

The supply ducts were installed along the beams, giving the appearance of a wider beam which did not mar the architectural beauty of the sales space. Only on the first floor, where the duct work had to be placed on the outside walls, was the duct work furred in. On the balance of the floors the duct work was painted in accordance with the decorative color of the ceiling so that the average customer does not notice the duct distribution.

## Hotels

### Hotel Cornhusker



THE air conditioning system for the second, third and fourth floors of the Hotel Cornhusker (installed by Sidles Co.) is a "Central Station" type with the apparatus located on the mezzanine floor in a space formerly used for storage purposes. The system is divided into two zones; one main riser supplies the North

half, another main riser feeds the South half. Branch ducts lead off of the main risers on each floor and the conditioned air is carried by a duct system throughout the guest rooms. All branches are equipped with easily accessible dampers for balancing purposes. All room registers are equipped with dampers so that conditioning may be cut off of any room desired and the temperature

desired by the room occupant may also be controlled by adjusting the grille damper.

Return air is taken out of the rooms and into the hall through door ventilators already present in the doors. In special instances it was necessary to install additional door louvers. Returning the air by this method automatically takes care of cooling the hallways. Two large return grilles in the hallway on each floor, one in the North and one in the South, carry return air from each floor down through main return risers to the air conditioning apparatus. The outside air duct is run in through the pipe space.

The system is designed for pre-cooling. Half of the total requirement of 52 tons is obtained from 60 degree city water; the remainder is obtained from direct expansion refrigeration. This type of system is economical because the water passing from the pre-cooling coils is passed through the condenser, thus utilizing the water twice. In addition, the compressor size is only half the size ordinarily required for a straight direct expansion system.

The air conditioning space on the mezzanine floor houses the filters, coils, by-pass dampers and fan.

The filter rack is composed of a "V" type bank of sixty filters arranged ten wide, three high, and



two deep. The pre-cooling coil arrangement consists of four 12-inch deep water coils, two high and two wide, with the headers in the center. Total face area of the coil assembly is thirty-two square feet. The direct expansion coils used with a 25 hp compressor, consist of a bank of four 12-inch deep coils arranged two high and two wide with headers in the center the same as the pre-cooling coils. All coils are mounted and bolted on a rigid framework.

The by-pass damper is mounted above the direct expansion coils and is the full width of the air conditioning apparatus casing.

The fan is a vertical upblast multivane type, capable of handling 20,000 cfm of air at 1.82 inches of water (static pressure). The fan is equipped with double inlet vane control operated by a motor and linkage assembly, controlled by an automatic static pressure regulator.

The air distribution system is zoned and controlled by modulating motors and dampers controlled by zone thermostats. The main supply duct from the fan is equipped with a static pressure regulator operating a modulating motor which in turn is connected by linkage to the fan vortex control, thereby governing the amount of air being circulated by the equipment according to the load demand. Each of the two supply zones is furnished with a modulating motor and damper controlled by a thermostat located in the return duct. In this manner, the amount of cooling is governed by the temperature of the return air.

The by-pass damper is actuated by a modulating motor actuated by a humidistat located in the South return air duct.

The operation of the cooling equipment is controlled by a thermostat also located in the South return air duct. This thermostat operates a motorized water valve to the pre-cooling coils and also starts the compressor. The arrangement is such that the water valve is opened and water flows before the compressor starts.

The barber shop and the beauty parlor have a separate system of 8 tons refrigerating effect. This unit also uses the 60 degree water for pre-cooling.

### Capital Hotel



THE Capital Hotel has installed year round air conditioning in its grill rooms, private dining rooms, drug store, and several leased spaces. For economy of operation and installation, a central system is used for the entire space. As there is quite a varied load in the different portions of the system, care was necessary in the design and final balancing of the air distribution.

Refrigeration is provided by a compressor in the basement. The supply duct work runs in a furred attic space above the first floor; the returns are run on the ceiling of the basement. Each private dining room has zone control, so the room may be shut off when not in use. Two of the leased spaces also have individual temperature control, achieved by volume dampers. These volume dampers may also be shut off by a single switch in the equipment room. This was necessary because the coffee shop and drug store are open late at night, while the leased spaces may be shut off at six o'clock.

Because of food odors from the restaurant, sufficient fresh air must be used at all times to dilute odors. An exhaust fan located in the kitchen also helps keep the odors out of the conditioned spaces. As part of the attic space is under a hot roof, it was necessary to insulate the supply duct work over most of the attic space.

Tempered air and moisture are also supplied for winter operation. An interesting feature of this system is the fact that the warm condenser water is taken from the compressor and pumped to a storage tank on the roof which furnishes water for the hotel lavatories, and toilet rooms.

## Office Buildings

### First National Bank

THE First National Bank Building was the first large office building to be entirely air conditioned in Lincoln. The system was installed in the spring of 1936, and has been in constant operation since that time. It is an eight story building, consisting of seven floors of office space, with the main floor occupied by the bank, and the basement by the First Trust Company. The entire building is conditioned for year round service.



The system is divided into three portions. The upper floors of the building are conditioned by units located on the second, fourth, fifth, and seventh floors of the building. Chilled water is circulated to these units from a shell and tube cooler in the basement, which is cooled from six 25 hp. compressors. The bank and trust companies are each served by separate units consisting of water coils, and direct expansion operated from a 25 hp. compressor. The total capacity of the system is 192 tons.

The design conditions are for inside temperatures of 80° dry bulb, and 50% relative humidity, when the outside temperatures were 100° dry bulb and 75° wet bulb. Under actual test the system has a capacity to achieve a 37° differential in temperature when the outside temperature reaches 115°. Under usual conditions the inside temperature is regulated automatically by a thermostat adjuster,

which changes the differential according to outside temperatures.

Each of the upper floors is divided into two zones, east and west. As this building is long and narrow, this type of zoning was most suitable. Each unit is individually controlled, and provides both cooling and heating, as well as humidification in winter, ventilation, and clean air the year round.

On the winter cycle, hot water is circulated through the water coils. Each coil is controlled by three-way valves which by-pass the water when it is not needed. Humidification is provided in winter from spray nozzles, controlled by humidistats and solenoids. Ventilation is provided by automatic fresh air dampers, which provide a plenum chamber temperature of 60° on the winter cycle, and a minimum of fresh air in the summer.

The six compressors on the shell and tube cooler are operated from an immersion thermostat in the cooler, which in turn controls a step controller, which allows only the required number of compressors to be in operation at any one time. There is a time clock that reverses the operation of these compressors, every twelve hours of operating time, and also a safety relay, which starts the compressors one at a time in case of a power failure.

The main control panel is located in the equipment room in the basement. From this point each of the units is operated, and pilot lights show which units are in operation.

A total air circulation of 58,500 cfm. is maintained on summer operation.

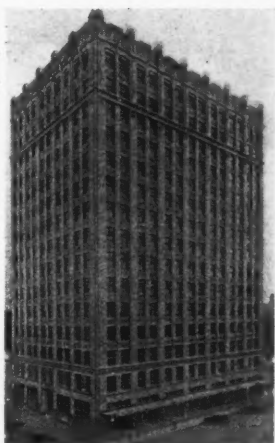
The mezzanine of the banking floor is cooled by a separate condensing unit and conditioner (year round). The cooling load is 10 tons.

### Sharp Building

THE present air conditioning system for the upper six floors of the Sharp Building, is of the "Central Station" type with the air conditioning apparatus located on the thirteenth floor. This system was designed to offset severe solar radiation problems.

The system is divided into two main trunks for each floor with easily accessible dampers for balancing purposes. Rooms exposed on the East, South and West are equipped with individual, thermostatically controlled dampers which automatically admit the correct amount of conditioned air necessary to these areas to maintain a constant desired temperature throughout the day, regardless of the position of the Sun and the resultant additional cooling necessary to take care of the Solar Radiation.

The return air is taken out of the rooms and into the hallways where it is returned to the conditioner through a closet space. Returning the air by this method automatically takes care of cooling the hallways. Outside air is taken into



the conditioner through a window with weather-proof louvers.

The chilled water producing system is located in the basement. It consists of two radial type, Freon compressors with condensers and chillers, together with the necessary piping, pumps, and control equipment.

Each compressor, rated at 75 hp capacity has a 75 hp electric motor directly connected on both ends to a 7 cylinder radial airplane type compressor. The compressors are similar to those in the Stuart building.

The air conditioning apparatus on the thirteenth floor houses the cooling coils, filters, by-pass dampers, fan equipment, and control equipment. The filter rack is composed of a "V" type bank of 100 filters arranged two deep.

The coil arrangement consists of eight 12-inch deep water coils, four high and two wide, with a by-pass damper arrangement between. Total face area of the coil assembly is 80 square feet.

The large fan used in conjunction with the air conditioning apparatus consists of a double inlet, multivane fan, capable of delivering 50,000 cfm. The fan is equipped with a double-inlet vane control, operated by a motor and linkage assembly, automatically controlled by a static-pressure regulator. This arrangement controls the amount of air delivered by the fan according to the load.

In addition to cooling, the system can be used to supply ventilation air to the six floors during winter months. The outside air intake is equipped with four steam coils which heat the ventilation air up to room temperature before it is mixed with the recirculated air. In addition this assembly houses a spray arrangement which adds moisture to the air when necessary in order to provide correct humidity conditions. This arrangement is also controlled automatically. [Three more floors have been conditioned lately.—The Editors.]

### Iowa-Nebraska Power Co.

THE Iowa - Nebraska Light and Power Company occupies a large, three-story building at the corner of 14th and "O" Streets. The entire three floors and basement are completely air conditioned.



The first floor and basement are conditioned from one unit, and the second and third floors by a second unit. Each unit has its own compressor. The total capacity of the system is 65 tons and a temperature of 78° is maintained throughout the building during the summer months. A time clock starts the fans and compressors in sequence in the morning and shuts them off at night, making the system completely automatic. A small cyclor is also installed in the compressor control circuits, so that only one compressor can start at a time. In case of power failure a program motor returns to the starting position, and starts the fans, and each compressor in steps.

A large steam coil in the lower floor unit provides all heat for the first floor and basement. The



second and third floor unit operates in conjunction with a direct radiation system and furnishes tempered air only. Each unit also has spray nozzles to furnish humidity in winter and the usual filter banks for cleaning.

The second and third floors are each divided into three zones, east, west and south. There is a large room on the south end of each floor which is handled separately by the south zone, as it is exposed to the sun the majority of the day.

Ventilation is provided by proportioning the outside air according to outside temperatures. In mild weather the maximum amount of fresh air is used, while in very hot and very cold weather, only the minimum amount of outside air is introduced. This is controlled automatically by a damper motor and outside air thermostat.

### Woodmen Insurance Building

WHEN the Woodmen's Insurance Building was constructed, a year round air conditioning system was installed. Four condensing machines in the basement serve three individual heating and cooling units, which cool the main floor, second floor, and third and fourth



floors respectively. The total capacity of the system is approximately 100 tons. The three units are all located in the basement with a duct system extending through the building. The units also have heating coils with sprays for winter operation. Control provides automatic operation both winter and summer.

### Lincoln Liberty Life Building



IN 1936 the Lincoln Liberty Life Building was completely remodeled and modernized at a total cost of \$180,000. Of this, \$28,000 was spent for a complete, year round air conditioning system to serve all the building except the stores on the ground

floor. The system consists of three six-cylinder compressors with a total capacity of approximately 75 tons. These machines provide chilled water through a shell and tube cooler. The chilled water is circulated to floor type air conditioning units on each floor of the five-story building.

The unit on each floor receives a controlled amount of fresh air which has been precooled and cleaned by an attic unit. This is mixed inside the unit with recirculated air which has been filtered at the unit. A part of this mixture then is drawn up through the cooling coils in summer, or the heating coils in winter. The remaining air is automatically by-passed around the cooling coil to supply a proper balance between the sensible and the

latent heat which must be absorbed by the air when it is introduced in the conditioned space. It then is mixed with the air which has passed through the coils and is drawn into the series of blowers at the top of the unit which force the air through the ducts. In winter all of the air normally goes through the heating coils, none of it being by-passed.

In the penthouse is a supply fan with a capacity of approximately 10,000 cfm. All fresh air is brought in by this fan. In summer this air passes through a precooling coil, and in winter through a heating coil. During the heating season the air is humidified after it leaves the heating coil by a steam humidifier placed in the air passage. The humidifier is controlled by a humidistat.

An unusual feature of the installation is that city water, which has a temperature of approximately 60°, is used for condenser purposes. This water is first taken to the attic of the building, where it passes through the precooling coils before going to the condensers in the basement. About 10° is added to the temperature of the water in its passage through the precooling coils, and the condensers add another 30°, so that it is discharged into the sewer at approximately 100°.

The fresh air passing through the precooling coils is reduced in temperature about 20°, all of the sensible heat being removed. It is estimated that this saves approximately twenty tons of refrigeration, reducing the size of the compressor plant accordingly.

The conditioning unit on any floor can be shut down without affecting the conditioning of the other floors. An exhaust fan in the lobby draws air down from the floors above and discharges it into the lobby and main entrance of the building.

### Stuart Building

THE Air Conditioning system installed for the entire Stuart Building is a complete year-round combination of unit systems and "Central Station" type systems with chilled water as the cooling and dehumidifying medium. The type of system is unique among Lincoln buildings.



The entire office space of the building from the second to the tenth floors inclusive is conditioned by the unit system using four hundred and eighty-four specially designed units. Each unit contains the necessary coil surface, blower assembly and drip-pan, all mounted in a rigid casing and bolted to the wall directly beneath each window. A decorative metal cabinet completely covers the whole assembly. Each unit is equipped with an individual temperature selection control which may be set at any desired temperature ranging from 65 to 85 degrees. In this manner, occupants of any area may adjust their temperature to suit their own individual desires. Each unit is also provided with a summer-winter switch.



The operation of this switch automatically shifts the control arrangement of each unit to either summer control or winter control. Each unit is also equipped with a water meter so that the amount of chilled water used in any particular unit for cooling purposes can be measured.

The chilled water producing system is located in the basement. It consists of six radial-type, Freon compressors with condensers and chillers, together with the necessary piping, pumps, and control equipment.

Each compressor, rated at 75 hp capacity has a 75 hp electric motor directly connected on both ends to a 7-cylinder radial, airplane type, compressor. Mounted directly over this arrangement is the condenser. Above the condenser and mounted on a heavy steel stand is the water chiller. The operation of this chilling system can be briefly explained as follows: The twin compressor and condenser assembly produces the same results as the ordinary refrigeration compressor and condenser. However, instead of the refrigerant being expanded through a finned surface coil over which air is passed to be conditioned, the refrigerant is expanded through a specially designed finned surface coil within the chiller tank. The water to be chilled also flows through this tank and in this manner, the necessary heat is extracted from the water to bring its temperature down to from 40 to 43 degrees. The water coming out of the chillers into the supply side of the system is cold enough to produce the necessary amount of cooling and dehumidification, and is circulated through the units in the building by pumps. An automatic unloader maintains a constant balance between the refrigeration delivered and the existing cooling load by cutting in or out one or more of the cylinders as the variations in the load calls for more or less refrigeration. In addition, all six compressor units are connected to an automatic step-controller. This controller automatically starts or stops any of the six compressors as necessary. Should four compressors be able to handle the total load at a particular time, the step-controller automatically shuts off two complete units. Should the load then increase, the controller will start up another compressor when necessary.

In addition to this unit system for the office space, two large ventilation systems, bringing in 28,000 cubic feet of fresh air per minute from the outside, provide the ventilation, part of the dehumidification, and filtering of air for summer operation. For winter, the system provides proper ventilation, proper tempering and filtering of the air. The ventilation air is carried by ductwork to each floor and pumped into the space above the hallway ceiling on each floor. From here the air filters out into the hallways through specially designed grilled light fixtures and from here through grilled hallway doors into the office areas. No air is recirculated in this system. Fresh air only is handled at all times.

For winter operation of the office floors, hot water is pumped through the units for heating purposes and again the desired temperature can be set on each individual unit. Together with the ventilation system, the office space is completely winter air conditioned.

In addition to the unit system for the office space, there are four "Central Station" type systems, two

being used to air condition the first floor areas both summer and winter, and two being used to provide complete year-round air conditioning for floors eleven and twelve occupied by the University Club. Each of these systems is equipped to provide proper temperature, humidity, circulation, ventilation and filtering of air both summer and winter.

All "Central Station" systems are provided with complete and compensating electric control and are remotely controlled from the main switch-board in the boiler room. All necessary safety controls and recording instruments were used to make the least amount of manual operation necessary.

### Nebraska Central Building



**T**HE first floor of this building, which is 25x142 feet, is occupied by the Building and Loan Company, and the second floor by Folsom Brothers Insurance Company.

An air conditioning unit is installed in the basement. Water pre-cooling is used and a 5 hp. compressor takes care of the rest of the load.

Fresh air is brought to the apparatus from the roof. Air is supplied to the conditioned rooms by ducts running the length of the space. High velocity outlets are used. Since there is a wide difference in the load between the 2nd and 1st floor, the spaces are zoned. Each supply duct has a damper and motor actuated by a thermostat to increase or decrease the supply of dehumidified air. The fan motor is operated manually, and the compressor is controlled by a thermostat.

For winter, the radiators are still in use, and fresh air is brought in to the space and heated to room temperature and supplied through the duct system. Temperature controllers are installed in both supply and return ducts to act as high and low limit controls. A damper with motor is installed in the outside air duct. This damper will close tight when the fan is not in operation.

### Barkley Building

**T**HIS is a five story office building with the main floor occupied by retail stores and shops and four floors of offices.

Having installed air conditioning for one of his tenants on the main floor in 1935, the owner decided that because of the excellent results he would condition the whole building so that all tenants might enjoy the bene-



fits. Consequently, before May 1, 1936, the entire building was conditioned.

No rentable floor space was used in this installation. Air conditioning machines are installed on each floor in the corridors north of the elevators. Ducts run down the corridors supplying cool, fresh, clean, dehumidified air to each office and return air is brought to the apparatus through transoms into the corridors. Fresh air is brought to the conditioners through ducts from windows on the east.

This building is 25 by 142 feet. One compressor of 10 hp is sufficient to handle the second and third

floors; one 15 hp compressor handles the fourth and fifth floors. Direct expansion is used; the compressors are located in the basement. The suction and liquid lines are run in the elevator shaft. The liquid is sub-cooled by installing the liquid line inside the suction line.

Each store and shop has its own individual air conditioning units. The jewelry store has a conditioner connected to a 3 hp compressor. The real estate offices and barber shop have two units and one 3 hp compressor; the cigar store has one unit and one 2 hp compressor.

## Restaurants and Taverns

### Mayfair Grille

THE Mayfair Grille in downtown Lincoln is cooled by a central station type system employing a conditioning unit with a 10 hp compressor.

The duct distributing system was especially de-



signed to blend in with the decoration and design of the interior. The ducts are run along center beams and outside walls with directional flow registers.

THE Kindy Optical Company next door to the Mayfair Grille is also cooled. The system has a year-round air conditioner sized for a summer load of 5 tons. The system also heats in winter.

### Y-Not-Eat Cafe

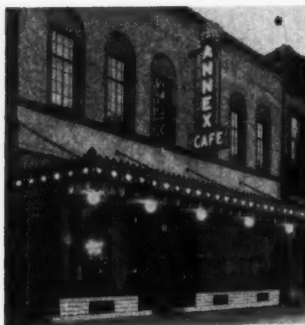
THE Y-Not-Eat Cafe is cooled by a store type air conditioner of five-ton capacity and blower of 2,000 to 3,200 cfm. This unit was installed on the balcony over the kitchen. Outside air is taken in from a shaded court to a return mixing chamber. The air is drawn from the conditioned space through a grille 8 feet from the floor line. Supply grilles are vertical bar, directional flow. At present water is used as refrigerant, but chilled water recommended for better results. The blower is low speed centrifugal type, driven by  $\frac{1}{2}$  hp motor.



### The Forum Cafe

THREE air conditioners (recirculating units) with one 10-ton condensing unit, supply cooled and dehumidified air for this restaurant. A separate ventilating system brings in outside air, passing the air through coils cooled with 60-degree city water. The total cooling load is 12 tons.

### Annex Cafe



THE Annex Cafe installed a complete central type, air conditioning system for the first and second floors, using compressors and equipment placed in the basement. The air distributing system is installed at the ceilings with branch ducts, risers, etc., for the first and second floors, built into partitions and behind furred ceilings on floors to be conditioned.

### Central Cafe

THE Central Cafe was the first complete air conditioning system installed in Lincoln. This is a central type system with all apparatus located in the basement. Air from the equipment is distributed by ducts placed against the ceiling of the restaurant. The riser from conditioning unit to ducts is concealed within a partition.

Two compressors, totaling 57 tons of refrigeration capacity, are used. Ammonia is the refrigerant and the air is cooled by passing through a large washer (washed air system). The conditioning system is for summer cooling only.



**Brass Rail Tavern**

**T**HIS tavern is cooled by one 4-ton spot cooler with a water coil and blower to circulate 2,500 cfm. No duct work is used.

**The Senate Lunch**

**O**NE 10-hp condensing unit coupled to one air conditioner, supply ideal conditions in this lunch room. The cooling load is 12 tons.

**Acme Chili Parlor**

**T**HE system in this restaurant is designed as a combination heating and ventilating system. However, the system is so arranged that 60-degree city water is circulated through the hot water coils for summer cooling.

**Small Offices****Y. W. C. A.**

**T**HE offices and lounge (with lobby) of the Y. W. C. A. are air conditioned by four, small capacity, unit conditioners to which duct work is attached for limited area air distribution. Each of the conditioners



serves a part of the total floor area; the total capacity of the four units is 12 tons. The cafeteria is cooled by a central system with the compressor (10 hp) and the conditioner placed in the basement. Air ducts run to first floor where the cafeteria is located.

**Northwestern Iron & Metal Co.**

**O**NE 6-ton water coil cooler with duct work extending into the main office and small private offices provides summer cooling.

**C. H. Arnold Office**

**T**HE office of Doctor Arnold is ventilated, cooled and the air is dehumidified by one air conditioner coupled to one 10-ton condensing unit. Water pre-cooling coils and direct expansion is used with the condensing unit. The total load is 9 tons.

**University of Nebraska**

**T**HE athletic department offices of the University of Nebraska are cooled by two 5-ton spot coolers using ducts extending into the main office and private offices for proper air distribution.

**R. S. Proudfit Lumber Co.**

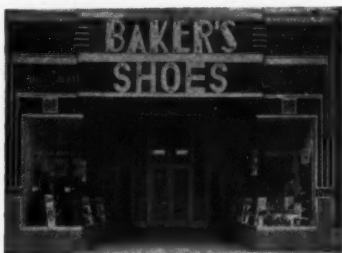
**T**HE offices of this lumber company are cooled with two air conditioners using 60-degree city water as the cooling medium for the coils. The load is 4 tons.

**Hompes and Peterson**

**T**HE offices of Hompes and Peterson, physicians, are cooled for patients and staff by one conditioner and one 4-ton condensing unit.

**Field, Recketts Office**

**T**HE offices of Field, Recketts and Recketts, lawyers, are cooled by one conditioner using 60-degree city water as the cooling medium passing the water through coils. The load is 4 tons.

**Specialty Shops**

**B**AKER'S Shoe Store provides summer cooling with a cooling machine and a 7½ hp condensing unit. The fresh, cool, dehumidified air, for summer comfort is introduced into the store directly from the machine located

in the space cooled. Front doors are left wide open; 30 per cent fresh air is taken from outside.

**Left—Bakers' Shoes****Famous Store**

**T**HE Famous Store (ladies ready-to-wear) installed a cooling system in 1936. The air conditioning unit is located in the basement, is rated at 15 tons capacity, and circulates about 10,000 cfm. Ducts extend to the first and second floors where branches run through the rooms along show cases. Water from the system is sprayed on the roof for further cooling effect. The complete system is able to maintain inside temperatures of 80 degrees at 110 degrees outdoors.



**Hovland-Swanson**

THE Hovland-Swanson Company was the first retail store in Lincoln to install air conditioning for their ladies-ready-to-wear department on second floor of the two-story building. Water sprays were used to reduce the roof load.



The installation is a "central conditioning" type with a ductwork distribution system.

It is a "precooling" job in that a part of the cooling is accomplished with the 60-degree available water passed through a water coil; the remainder of the conditioning is accomplished by refrigeration. The "off" water from the water coil is passed twice.

The installation is also equipped with heating coils and outside air preheating coils for winter operation. A spray arrangement for winter humidity is included in the winter system.

The entire system, both for winter and summer, is equipped with a complete set of automatic control equipment. One 3 hp. compressor is used for precooling the first floor only; the total first floor load is 7 tons. Two units of 3 hp. each are installed on the second floor with independent duct work distribution systems.

**Ames-To-Please**

THE retail clothing store of Ames-to-Please (ladies ready-to-wear) has a sales room in the basement and another sales room on the street level. Two spot coolers are used. The basement unit is rated at 4 tons using city water; the first floor unit is rated 6 tons using city water. No duct work is employed; the air is blown directionally into the spaces to be cooled.

**Lerner Store**

THE newly remodeled Lerner Store is completely air conditioned for year round comfort of its patrons. The system is unique for Lincoln, due to the fact that it has an evaporative condenser for economy of operation. The equipment consists of a 15 hp two speed compressor, the evaporative condenser, and one air

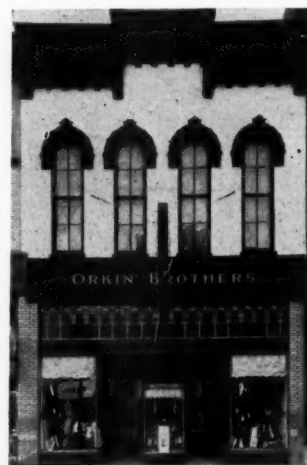
conditioning unit. The compressor is controlled from a two-temperature thermostat which automatically changes the compressor from high to low speed as the room temperature reaches the desired temperature. If the room temperature still de-

creases then the thermostat throws off both the compressor and evaporative condenser. The two-speed feature assures economy of operation.

On the winter cycle the store is heated from the conditioning unit, which also provides ventilation, and filters the air. A night thermostat starts the fan in case the room temperature drops below the desired setting when the system is off.

**Orkin Brothers**

THE ladies ready-to-wear store of Orkin Brothers uses a spot cooler of 8 tons capacity placed on a platform at the back of the store. City water at 60 degrees is used with 5,000 cfm of air with all the cooled air being blown directly into the store. Outside air is brought in through a window behind the unit. There is no duct work used, but the air is introduced at high velocity. The waste water from the unit is sprayed onto the roof.

**Barker's Shoe Store**

BARKER'S Ladies' Shoe Store does summer cooling with a 5-ton air conditioner using 60-degree water for cooling. The apparatus is suspended from the ceiling and brings in fresh air from outside and discharges the cooled air through the space with front doors wide open.

**Magee Clothing Co.**

THE entire building of the Magee Clothing company is arranged for year-round air conditioning. For



summer cooling, three compressors with a rated capacity of approximately 55 tons are used. Condensers are shell and tube. Motors are two 15-hp and one 10-hp. For winter conditioning steam coils in the system heat the air. Air distribution is secured by a complete duct system running through all floors.

### Clark Clothing Store

**T**HE Clark Clothing store is year round air conditioned by means of one conditioning unit using



60-degree water for cooling. Outside air is brought in through a window in the rear of the store, is mixed with return air from the space cooled and

is discharged through ducts which run along the top of the clothing cases on each side of the space.

### Cadwallader Fur Co.

**T**HE Cadwallader Fur Company has a modern display room and factory with a year-round conditioning system engineered especially for the occupancy needs of the store. The display room on the main floor is cooled by a compressor having a capacity of approximately seven tons, using direct expansion. The conditioning unit is located on a small balcony and contains the cooling coil and a steam coil for tempered air on winter operation. The unit also provides humidity, ventilation and cleans the air with replaceable type, dry filters.

The factory on the upper floor of the building is cooled by another seven ton compressor with a unit suspended from the ceiling of an adjacent rest room. Even temperatures are maintained summer and winter, with the proper moisture making it possible to keep the furs in a workable condition.



## Stores and Shops, General



**T**HE Harley Drug Company occupies the busiest corner of Lincoln's shopping district. The traffic in the store is large; there is no ready space available for apparatus. The basement and rooms above the store are used for storage. The entrance to the store is northwest, so

that in the winter, due to heavy traffic, the store was always cold and drafty. In the summer the front doors are left open.

Mr. Harley, who is a director of The Liggett Company, decided to condition the store in the winter of 1937, and the installation was ready for operation when warm weather arrived.

A unit heater is installed above the show window on the north wall. This heater has a capacity equal to 580 square feet of steam radiation and blasts hot air in front of the entrance when the weather is severe. In order to keep the air circulated and to secure some ventilation, the store operates the air conditioning blower at the same time.

The air conditioning unit is hung from the roof of the building. The air passes through a duct which drops down through the ceiling of the store and discharges 45 feet to the north wall and 15 feet to the south, which takes care of the people on the

balcony. Return air is brought to the apparatus through a grille in the ceiling of the prescription room and up through the balcony by a duct which connects with the outside air duct from a window on the second floor.

The compressor is located under the sidewalk, west of the building. The refrigerant is sub-cooled. The fan motor is started manually, and the compressor is operated from the thermostat. The two are cross connected so the compressor cannot operate unless the fan is running.

### Rudge & Guenzel Beauty Parlor

**O**NE air conditioner coupled with one 10-ton condensing unit and using water pre-cooling coils maintain excellent conditions under the heavy cooling load of this beauty parlor.

### Magnl Barber Shop

**O**NE air conditioning unit using 60-degree city water is used to cool this barber shop with its load of 2 tons.

### Sartor's Jewelry Store

**T**HIS corner store is cooled by one spot cooler located over the front door. The capacity of the unit is 4 tons with city water at 60 degrees. About 2,500 cfm of air are circulated.

**University Drug Co.**

**T**HIS drug store is cooled by one spot cooler of 4 tons capacity located over the front door. No duct work is used. Cold city water is the cooling medium.

**Stiners Drug Store**

**T**HIS drug store is cooled by two unit coolers installed along the south wall of the store and suspended from the ceiling. The compressor and condenser are located in the basement and connected to the two unit coolers by copper pipe, well insulated.

**F. Gardner & Sons**

**T**HE jewelry store of Fred Gardner and Sons is summer cooled by a spot cooler placed over the front door. No duct work is used. The unit is rated at 2 tons capacity using 60-degree city water in a water coil.

**Mrs. Stover's Candy Store**

**T**HE summer cooling system in this small store employs a 5-hp compressor and a coil conditioner located in the basement. Ducts to the store with outlets at several points insure thorough air distribution.

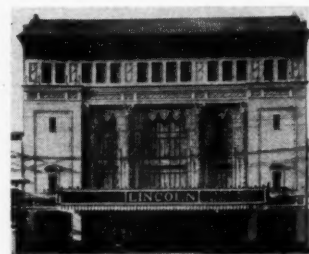
## Theatres

**Varsity, Colonial, Capitol**

**T**HERE are three theatres in Lincoln—the Varsity, the Colonial, the Capitol—having partial cooling systems some years old. In all three buildings, an air washer system installed over the stage, is used to cool and partially dehumidify. Additional data are not available.

**Lincoln Theatre**

**D**URING the summer of 1935 there was installed a system of air conditioning in the Lincoln Theatre, which, with the Stuart Theatre which was cooled in 1927, gives the city of Lincoln two completely conditioned theatres. The plant in the Lincoln Theatre has five machines with a capacity of approximately 100 tons of refrigeration. Due to the low cost of water, the condenser water is wasted after use.



The compressors are operated from a thermostat which controls a step controller. A time switch reverses the operation of the compressors every twelve hours. The system is thoroughly automatic, and does not require the services of an engineer, except for occasional oiling and inspection.

**Stuart Theatre**

**W**HEN the Stuart Building was constructed in 1927, a complete cooling system was installed in the theatre located on the lower floors of the building. The theatre has a seating capacity of over 2,000 seats, and is served by a 100-ton carbon dioxide plant. The complete system was engineered and installed locally.

**Tap Water Cooling**

The installations reported on preceding pages employ mechanical refrigeration or can be directly converted into tonnage. Not so easily converted to tonnage are the installations on the opposite page where tap water through coils is the cooling medium. The tonnages shown have been theoretically calculated on a Btu basis.



IN addition to the installations reported individually, a large number of small systems have been installed by the G. A. Crancer Co. employing a locally assembled unit sold under the trade name — Northernair. This unit consists of a housing fabricated by the sheet metal firm of Rudge and Guenzel. Inside the housing are the blower, motor and a water coil or coils. The systems installed up to January 1, 1938, are as follows—

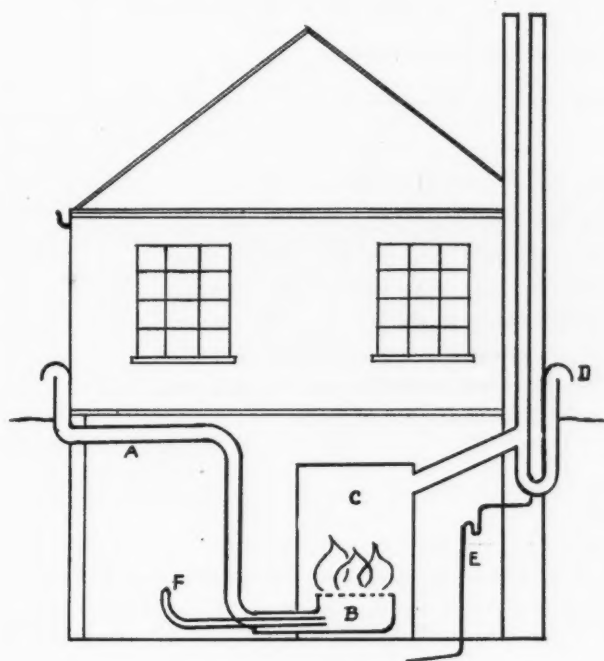


Installation	Number of Units	Number of Coils	Total Capacity, Tons
Beacon Coffee Shop.....	1	1	3
Dr. L. B. Schreve Office.....	1	1	1½
Dressback Beauty Shop.....	1	2	3
Townsend Studio .....	2	1 each	1½ each
Smith Baking Co.....	1	1	1½
Federated Finance Co.....	1	2	3
Moeller Grocery .....	1	2	3
Dearth Cafe .....	1	2	3
Ideal Cafe .....	1	2	3
Dalton Beauty Shop.....	1	1	1½
Woods Brothers Co.....	2	2 each	3 each
Wendelin Baking Co.....	1	1	1½

Poska Delicatessen .....	1	2	3
Chas. Dezlotz Insurance Co.....	1	1	1½
Cosmetique Beauty Shop.....	2	2 each	3 each
Bertie's Cafe .....	1	2	3
Lincoln Bowling Parlor.....	1	2	3
Chambers & Holland, Attys.....	3	1 each	¾ each
Union Fire Insurance Co.....	3	2 each	3 each
Benefit Mutual Life Co.....	4	2 each	3 each
Nebraska Credit Co.....	3	1 each	1½ each
E. J. Walt Music Co.....	1	2	3
Old Line Life Ins. Co.....	2	1	1½ each
Gilmore-Danielson Drug Co.....	1	1	1½
Liberty Buffet .....	1	2	1½
Meier Drug Co.....	1	2	3
Midwest Life Insurance Co.....	1	2	3
Slipper Shoppe .....	1	2	3
Greenwich Tavern .....	2	2 each	3 each
Bob's Coffee Shop.....	1	6	9
Liberty Barber Shop.....	1	2	3
Jensen Beaute Shop.....	1	2	3
Tripp's Beaute Shop.....	1	1	1½
Neta Marie Beaute Shop.....	1	2	3
Citizen Limited Life Ins. Co.....	2	1 each	1½ each
Univ. of Nebraska (Teachers College) .....	1	1	1½
Municipal Court .....	1	3	4½
Gohde School of Cosmetology...	1	2	3
Smith's Home Dairy.....	1	2	3
Burns Potter Co.....	1	1	1½
Dan's Coffee Shop.....	2	2 each	3 each
Bon Ton Cafe.....	1	1	1½
Moose Lodge .....	1	1	1½
Bradfield Pharmacy .....	1	3	4½

## Air For Oil Burner Combustion—By E. C. Schisler

IN my experience with real estate I have noticed that architects seldom make any provision for a sufficient supply of air to the heating plant for combustion. They seem to rely on leaky windows and doors and



flimsy construction to let in enough air. I have seen instances where oil burner maintenance men and gas company trouble shooters have propped open a basement window or taken out a pane of glass to let in air.

I have thought of bringing air in from out-of-doors through a metal duct to the burner and also connecting the check draft with an airtight duct to the out-of-doors, thus isolating the combustion chamber completely from the air in the building, as illustrated in the following diagram. In the case of gas fuel the condensate is drained off to the sewer through the pipe "E."

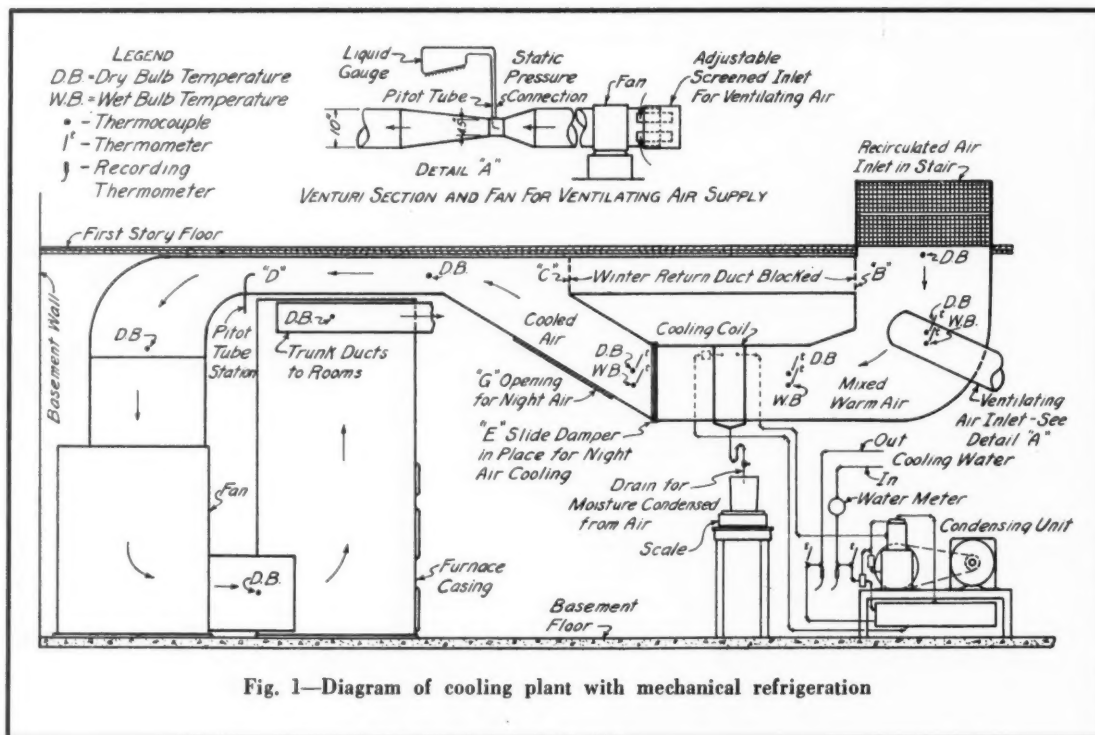
The conventional check draft is like a fire place without a damper drawing heat out of the building at all times. Furnishing the burner and check draft with air from out-of-doors through air tight ducts will permit complete weatherstripping, calking and insulating, eliminate the infiltration of dust and cold air and insure a sufficient supply of air for combustion. I know of an instance where building a fire in the fire place caused a downdraft in the flue of the gas heating furnace and put the pilot out. The gas companies remedy was to open a window.

In the following diagram "A" is the air supply duct to the burner "B" in the combustion chamber "C" and the duct "D" connects the check draft with the out-of-doors.

# Study of Summer Cooling in the Research Residence Using a Small Capacity Mechanical Condensing Unit<sup>†</sup>

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This paper is the result of research sponsored by the AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS in cooperation with the *National Warm Air Heating and Air Conditioning Association* and the University of Illinois.



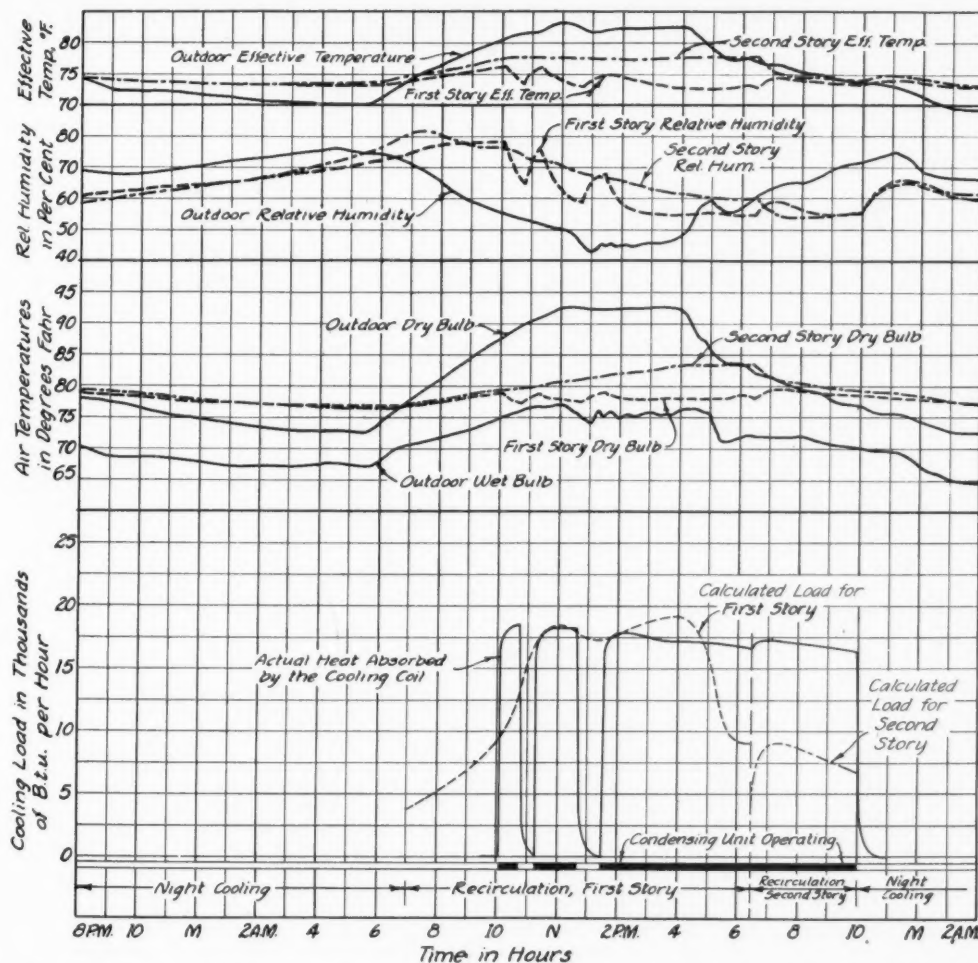


Fig. 7—Actual and calculated cooling load on Residence and air temperatures. Test No. 19, Series 2-37, August 17, 1937

### Results of Tests with Cooling on First Story During the Day and on Second Story at Night

#### General Conditions

The test made on August 17, 1937, was selected as typical of the operation obtained when cooled air was distributed to the first story rooms only until 6:30 p. m., and to the second story rooms only after 6:30 p. m. The results for the tests, made under conditions of operation for Series 2-37, are shown in the second and third columns of Table 1 and in Fig. 7.

The values listed in the second column of Table 1 show the average conditions that were maintained in the first story rooms at 3:30 p. m.; while the values listed in the third column show the average conditions that were maintained in the second story rooms at 7:30 p. m. The outdoor air temperature was about 93 F for a period of four hours and the day may be considered as a medium warm day.

#### Operating Characteristics

The operating characteristics for this method of operation are shown in Fig. 7. Outdoor air had been circulated through all the rooms of the house during the night previous to the test, from 8 p. m. to 7 a. m., by means of the basement fan. At 7 a. m. the recirculation of the indoor air, together with the addition of outdoor air for the purpose of ventilation, was started on the

first story alone. Practically the same quantities of both recirculated air and ventilation air, as were circulated on both stories in the first series of tests, were circulated on each individual story in this second series of tests. Hence the quantities of air circulated, based on one story alone, were approximately equivalent to six recirculations per hour and two changes of outdoor air per hour, making a total of eight air changes per hour delivered by the fan. The ratio of the heat brought in by ventilation air to the total heat gain for the story was greater in this series than it was in the first series of tests.

On the test shown in Fig. 7 the condensing unit operated intermittently from 10:05 a. m. to 1:31 p. m. As in previous tests, the intermittent periods of plant operation were accompanied by large changes

in the relative humidity and in the effective temperature. The comfort conditions during the off-periods of the plant were not as satisfactory as those maintained during the on-periods of the plant. These results are consistent with all of the results of tests made over the period of from 1934 to 1936, inasmuch as they all indicated that the indoor comfort conditions were more satisfactory on relatively hot days when the plant operated continuously than they were on the milder days when the plant operated intermittently. In this connection it may be mentioned that the use of a cooling unit or operating method which was just sufficient to maintain the desired indoor temperature at all times would eliminate these off-periods and the accompanying periods of high humidity. Any method of control or operation which would tend to modulate the capacity of the cooling unit to more nearly conform with the cooling requirements should prove more satisfactory than the intermittent operation of a unit having fixed capacity.

On this test, the condensing unit operated continuously from 1:31 p. m. to 10 p. m. The indoor comfort conditions on the first story remained constant and were entirely satisfactory until 6:30 p. m. From 6:30 p. m. until 10 p. m., when the cooled air was distributed to the second story rooms only, the indoor temperature, humidity, and effective temperature on the first story increased slightly, but the conditions were acceptable. It is probable that on extremely severe days, the conditions on the first story after 6:30 p. m. might prove uncom-



fortable, and an additional investigation under these severe weather conditions is required.

It may be observed that the temperatures in the rooms on the second story increased steadily from 76.8 F at 7 a. m. to 83.5 F at 6:30 p. m. Since no air was recirculated on the second story during this interval, and the windows remained closed, the air conditions in the second story rooms were not satisfactory. The contrast between the warm, stuffy environment on the second story and the cool, fresh environment on the first story was particularly striking. The conditions were so noticeably different, particularly in late afternoon, that the occupants of the house preferred to remain on the first story. This limitation and restriction in the usage and occupancy of the entire house may prove to be undesirable in some installations, where sewing rooms and utility rooms are located on the second story. The normal living habits of the occupants should, therefore, be considered in the application of zoned installations of this nature.

During the interval when cooling was applied only on the first story, the relative humidity on the second story decreased from 77 per cent at 10 a. m. to 60 per cent at 6:30 p. m., whereas ordinarily when no cooling was done in the house the indoor relative humidity tended to remain fairly constant. This reduction in relative humidity on the second story was caused by a reduction in the moisture content of the air and not merely by the higher air temperature. The moisture content decreased from 116 grains per pound of dry air at 10 a. m. to 104 grains per pound at 6:30 p. m. This reduction of 12 grains per pound of dry air on the second story accompanied a reduction in the moisture content on the first story amounting to 37 grains per pound, and indicated that the circulation of relatively cool dry air on the first story appreciably affected the conditions on the second story. As a result of this the effective temperature on the second story remained practically constant in spite of the fact that the dry-bulb temperature increased.

At 6:30 p. m. when the cooled air was distributed only through the registers on the second story, the reduction in relative humidity and temperature occurred quite rapidly during the first hour. The reduction in temperature occurred very slowly after that time due to the effect of the heat absorbed in the structure. This latter effect is also indicated, as shown in the bottom part of Fig. 7, by the wide discrepancy between the calculated cooling load on the second story and the actual load absorbed by the plant. During the interval from 8 p. m. to 10 p. m. the actual load was more than twice as great as the calculated load, while the indoor air temperature on the second story decreased from 80.5 F to 79.3 F, giving a total drop of only 1.2 F. The degree of comfort on the second story, as measured by the effective temperature, did not attain that represented by 74.5 deg until approximately two hours after the cooling was begun on the second story. Even at 10 p. m., 3½ hours after the cooling was begun on the second story, the effective temperature was 74 deg, only slightly below the upper border line of comfort. It is most probable that on a hotter day the conditions on the second story would not be completely satisfactory between the hours of 6:30 p. m. and 10 p. m. Additional data on this point are desirable.

In general, therefore, subject to the limitations discussed, the method of cooling on the first story during the day and on the second story during the night may be considered as reasonably satisfactory. The method requires a zoned duct system in which all of the rooms on one story are supplied with air from a trunk duct separate from those supplying air to other stories. Such an arrangement may not be practical in all installations. The restriction in the usage of the house may prove objectionable in some cases. Furthermore, the same unit when used to cool the entire house during the comparatively mild season of 1937 proved almost as satisfactory without restricting the space suitable for occupancy. On the whole, the comfort conditions attained on the first story rooms were slightly more satisfactory than those maintained when the small condensing unit was used to cool the entire house. However, the comfort conditions maintained during the off-periods of the plant were subject to improvement, and furthermore more satisfactory conditions as a whole would have resulted if the number of off-periods of the plant could have been reduced. The conditions attained on the second story were just on the upper border line of comfort, and a larger capacity would have been required in order to produce a more rapid reduction in the temperature.

#### Summary of Seasonal Results

Table 5 gives a summary of the total quantities obtained during the summer of 1937. This season was comparatively cool and in this respect was in decided contrast to the preceding hot summer. The total of 862 degree-hours above 85 F, which was about one-fifth that obtained for 1936, is a good indication of the difference between the two seasons. The total numbers of days with temperatures 85 F or over and 90 F or over for the season of 1937 were 61 and 23 respectively. The

Table 5—Summary of Results of Tests for Season of 1937

<b>WEATHER DATA</b>	
1. Total hours above 85 F for season of 1937.....	301.9
2. Total hours above 90 F for season of 1937.....	40.1
3. Total degree-hours above 85 F for season of 1937.....	862.4
4. Total degree-hours above 90 F for season of 1937.....	63.7
<b>NIGHT AIR COOLING</b>	
5. Total number of nights with cooling by fan.....	76
6. Total running time for fan, hours.....	845.9
7. Average rate of power input to fan, watts.....	453
8. Total power input to fan, kilowatt-hours.....	390.2
<b>AIR RECIRCULATION WITHOUT COOLING</b>	
9. Total number of days.....	75
10. Total running time for fan, hours.....	674.8
11. Average rate of power input to fan, watts.....	432
12. Total power input to fan, kilowatt-hours.....	291.4
<b>AIR RECIRCULATION WITH COOLING</b>	
13. Total number of tests.....	28
14. Total running time for fan, hours.....	220.6
15. Average rate of power input to fan, watts.....	437
16. Total power input to fan, kilowatt-hours.....	97.4
<b>COMPRESSOR OPERATION</b>	
17. Total number of hours.....	199.0
18. Average rate of power input, watts.....	1396
19. Total power input, kilowatt-hours.....	277.9
20. Total quantity of cooling water, gallons.....	11,961
<b>COMBINED TOTALS</b>	
21. Total running time for fan including night air cooling, hours..	1766.8
22. Total power input to fan including night air cooling, kilowatt hours .....	779.0
23. Total power input to compressor and fan including night air cooling, kilowatt-hours .....	1056.9

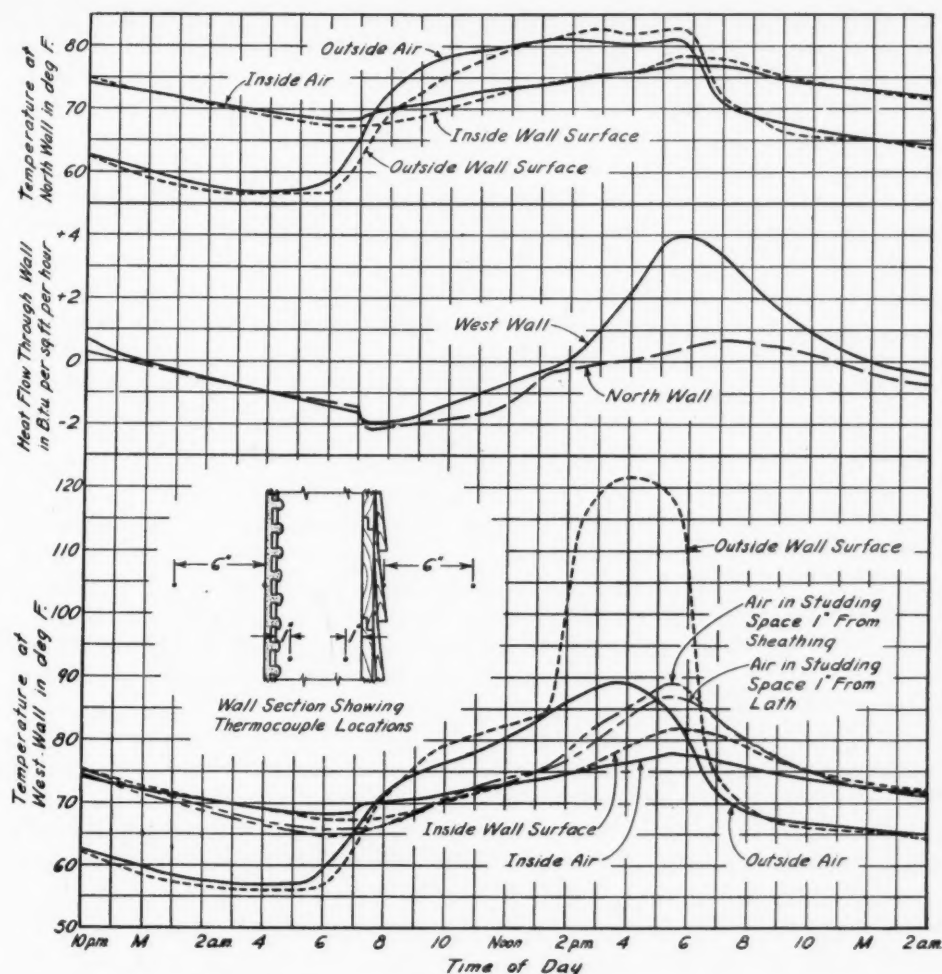


Fig. 8—Heat flow through walls and temperatures at wall sections for August 13, 1937

severity of the season, as measured by degree-hours, is apparently determined largely by the total number of days on which the maximum temperature exceeds 90 F. The outdoor humidities were more nearly normal during 1937, and were much higher than those obtained during the hot season of 1936.

From Item (21) in Table 5 it may be observed that the total time that the fan was running, including cooling with outdoor air at night and recirculation during the day, was 1756.8 hours. The total cost for electricity for operating the fan, based on a rate of 3.1 cents per kilowatt-hour for electricity, was \$24.13. The total time of operation of the compressor was 199.0 hours and the cost of electricity for this purpose was \$8.61. The total amount of water actually used for the condensing unit was 11,961 gal. At the prevailing rate of 33 cents per thousand gallons, the total cost for water was \$3.95. The cost for both electricity and water for the season was \$36.69. Even allowing for two days in early June during which the compressor was not ready for operation, the total seasonal cost would not have exceeded \$40. It may be noted that the cost of operation of the condensing unit was only one third of the total cost, the cost of operation of the circulating fan accounting for the other two thirds. Since the variations in seasonal demand were extremely wide, a comparison of the cost obtained with the small condensing unit with that obtained with other types of cooling units might to a certain extent be misleading.

### Results of Study with Heat-Flow Meters

#### Temperature Studies

The data obtained from the two heat-flow meter installations over a period of 29 days were plotted on a continuous chart, and this chart was used as a basis for the analysis of results. A typical section from the chart for a 28 hour period is shown in Fig. 8. It may be noted that the temperatures were continually changing and that thermal equilibrium was never attained. This cyclical variation both in the temperatures and in the direction of heat flow does not conform with the assumption of thermal equilibrium, which is invariably made in the calculation of heat losses or gains under given conditions of sun effect and temperature difference between the indoors and outdoors. The top set of curves shows the air and surface temperatures obtained at the north wall section, while the lower set shows those obtained at the west

wall section. The two curves in Fig. 8 between the upper and lower sets show the actual amounts of heat passing through the inside surface of the two walls, as indicated by the readings of the heat-flow meters. These meters were located one on each wall, directly below the thermocouples installed to obtain the temperature gradient through the wall.

It may be observed from Fig. 8 that there existed an appreciable interval between the time at which the outdoor air temperature attained a maximum value and that at which the indoor air temperature reached a maximum. In order to obtain the average values of the times at which various parts of the wall sections attained their maximum temperatures the data obtained from the 29 days were averaged, and are shown in Fig. 9. The values for the west wall, which was exposed to the sun, were not appreciably different from those for the north wall, which was not exposed to the sun. The lag between the times at which the outdoor air temperature was a maximum and the indoor air temperature was a maximum was approximately 2.5 hours. Also, the lag between the times at which the outdoor surface temperature reached a maximum and indoor surface temperature attained a maximum was approximately two hours.

#### Studies of Heat Transmission

Preliminary calculations of the conductance of the wall section, as determined from actual measurements of

the surface temperatures and the heat flow through the heat-flow meters, gave results that were materially less than the values obtained for similar walls from laboratory determinations under conditions of thermal equilibrium. This indicated either that the conductance value determined from laboratory investigations was in error or that conditions of thermal equilibrium were not attained in the actual wall exposed to normal temperature variations. The former supposition is not tenable,

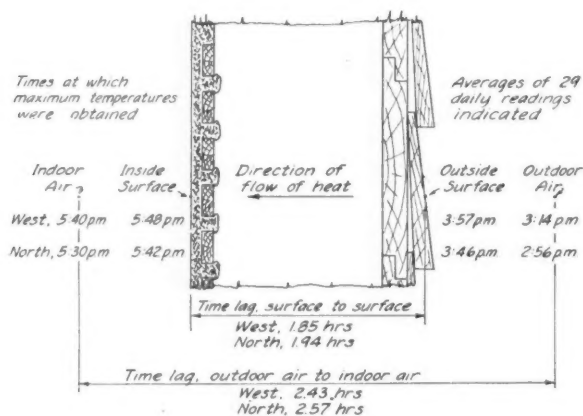


Fig. 9—Average values of times at which maximum temperatures were attained in wall sections

whereas the latter condition was actually known to exist.

This discrepancy between the measured and the calculated values of the heat flow through the wall is illustrated by the curves in Fig. 10. The calculated values were determined from the following equation<sup>8</sup>:

$$H = \frac{UeI}{f_o} + U(t_o - t_i)$$

in which

$H$  = heat transmitted through wall in Btu per square foot per hour,

$U$  = overall coefficient of heat transfer, Btu per square foot per hour per degree difference in temperature,

$e$  = coefficient of absorption of solar radiation, (0.40 for weathered white paint),

$I$  = solar intensity normal to the surface, in Btu per square foot per hour,

$f_o$  = outside surface coefficient, Btu per square foot per hour per degree Fahrenheit,

$t_o$  = outdoor air temperature, degrees Fahrenheit,

$t_i$  = indoor air temperature, degrees Fahrenheit.

It may be noted from Fig. 10 that the maximum value of the calculated heat flow through the west wall was equal to 6.3 Btu per square foot per hour and occurred at 4 p. m.; whereas the maximum value of the heat actually transmitted into the room as measured by the heat-flow meter, was 3.9 Btu per square foot per hour and occurred at 6 p. m. The time lag between these maximum values was 2 hours.

It was also observed in these studies that at certain times of the day the temperature in the studding space was higher than those of both the indoor and outdoor surfaces of the wall. That is, under these conditions the heat flow in the wall was occurring simultaneously to the outdoors and to the indoors. The calculated

values of heat transmission are of little significance under such conditions; the significant values being given by the heat-flow meter, which on account of its location on the inside surface of the wall measures the actual flow of heat into the room.

During periods when the outdoor air temperature was increasing, the temperature of the material comprising the wall structure was usually also increasing. As explained in the section on heat absorbed by the structure, the total amount of heat impressed on the wall appears not only as heat passing through the heat-flow meter but also as heat which tends to increase the temperature of the wall structure, and the discrepancy between the maximum values shown in Fig. 10 has been attributed to this factor, although it is also possible that the presence of the heat meter itself may have a disturbing effect. It is evident, however, that in walls of the type tested, the lack of equilibrium conditions results in changes in the amount of heat absorbed or given up by the structure and affects the amount of heat transmitted through the wall; so that the calculated values of the heat flowing through the wall at any given time, when used as an index of the heat actually transmitted to the air in the structure, are not only meaningless, but may also be misleading. Furthermore, under summer conditions the maximum amount of heat transmitted through the inside surface of the wall into the inside of the structure may be less than the maximum heat flow through the wall as calculated from the indoor and outdoor conditions.

### Summary and Conclusions

The following summary and conclusions may be considered as applying to the Research Residence and the conditions under which the tests were conducted.

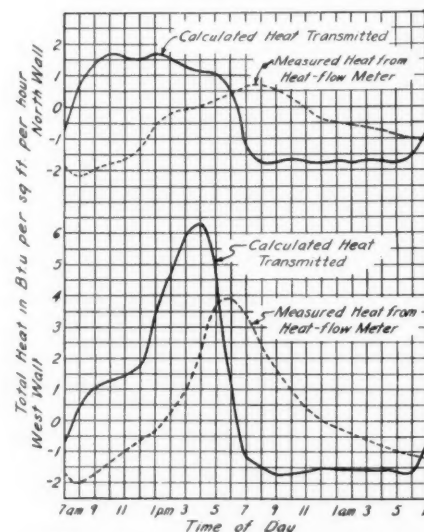


Fig. 10—Heat flow through walls of Research Residence for August 13, 1937

(1) In order to maintain the same effective temperature, the unit having the smaller capacity was operated to maintain an indoor dry-bulb temperature somewhat lower than that maintained with a unit having a larger capacity. Furthermore, it was advisable to allow for a rise in the indoor temperature on hot days when the cooling plant did not have sufficient capacity to main-

tain a constant temperature.

(2) The cooling capacity of 17,300 Btu per hour was found to be sufficient for both stories for days on which the maximum outdoor temperature rose to 95 F and the minimum outdoor temperature during the night preceding the test did not exceed 71 F. The daily median temperature (average of maximum and minimum outdoor temperature) of 83 F may be considered as

(Continued on page 98)

<sup>8</sup>Loc. cit. Note 6. Appendix B, Method Used for Calculation of Cooling Load, pp. 131-134.



# Attic Fan Installation Practices

This article (Part 2 of two) is a recapitulation of 1938 practices covering installation of attic fans to eliminate noise, vibration, whistle and to insure easy air flow to the fan and out of the attic. The information and illustrations have been taken from manufacturers' literature, from correspondence and from actual problem jobs. To manufacturers and contractors who have contributed material, we express our appreciation.

**N**OISE from an attic fan system generally can be traced to two sources. First, the rush of air through the grille, through the fan, around obstructions in the housing and, secondly, noises originating from vibration.

Noise caused by air is ordinarily taken care of by sizing the grille so that the velocity of air through the face is not over 500 to 600 feet per minute. A properly constructed housing presents a smooth surface to the air flow. When the fan is placed several feet away from the grille the turn tends to reduce noise. Hence, unless there is some very peculiar construction air noise should be easy to prevent.

But noises originating from vibration are a bothersome problem. The manufacturers generally have perfected their fans so that vibration of the parts of the fan are seldom encountered. Vibration of sections or panels of the air duct are common and can be prevented only by carefully designing and fastening the pieces of the housing together. Large panels of too thin plywood or board sometimes vibrate especially when large volumes of air are passing through or when the pressure on the housing is inward due to some shutting off of the air from the house. These noises of vibrating panels, vibrating pulleys, cords, fixtures can only be eliminated by careful attention to details.

The really troublesome noises come from hasty or careless mounting of the fan unit. Despite all

the work done in this field, a poor installation still makes noise. The methods adopted by contractors and manufacturers to prevent fans from transmitting vibration to the house structural parts have been numerous. Following is a brief summary of some of the most practical ideas.

The group of manufacturers who furnish their fan housed and mounted in a box which, in turn, is connected to the air duct, have worked out several methods of eliminating vibration. First of all the connection between the fan box and the air duct is generally made with some flexible material. This keeps any vibration from working back to the floor or the duct.

The Robbins & Myers unit has rubber feet under the fan frame and these feet rest on the fan box. The fan box, in turn, is held off the attic floor by a cushion panel of soft rubber (see Fig. 6). Air Controls, Inc., mounts the fan rigidly in the fan box, but holds the box off the floor by several large rubber feet.

American Blower Co. and Reed Unit-Fans, Inc. (both furnishing the fan in a cabinet) depend on rubber strips and foot mountings to kill any vibration from fan cabinet to supporting floor.

Viking Air Conditioning Corp. furnish a "V" shaped angle iron bracket as shown in Fig. 7. The bracket rigidly supports the fan box and depends for vibration deadening upon the rubber ball insulators shown. Where the fan must be supported

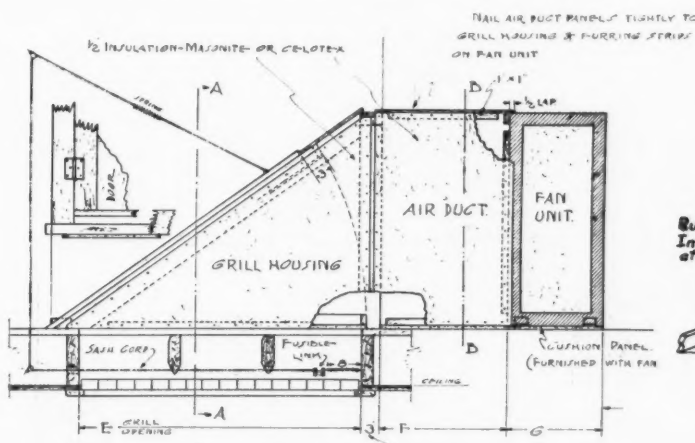


Fig. 6

This fan housing suggested by Robbins & Myers Co. is built of insulating board. The sloping top minimizes material and forms a door to ventilate the attic. The fan away from the opening reduces noise.

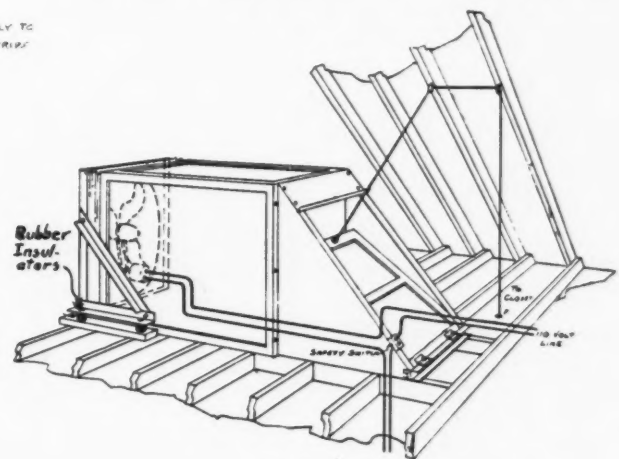


Fig. 7

Viking Air Conditioning Corp. suggests this housing with a door to ventilate the attic and a substantial fan box mounted on rubber.

from the roof rafters and held clear of the floor, the brackets are inverted and when so placed suspend the unit through the rubber feet as shown in Fig. 10. The air duct is built on the floor; the canvas connector killing vibration between air duct and fan box.

Belanger Fan and Blower Co. mounts the fan in rubber in the shipping crate; the crate to be used to form part of the air duct. Peerless Electric

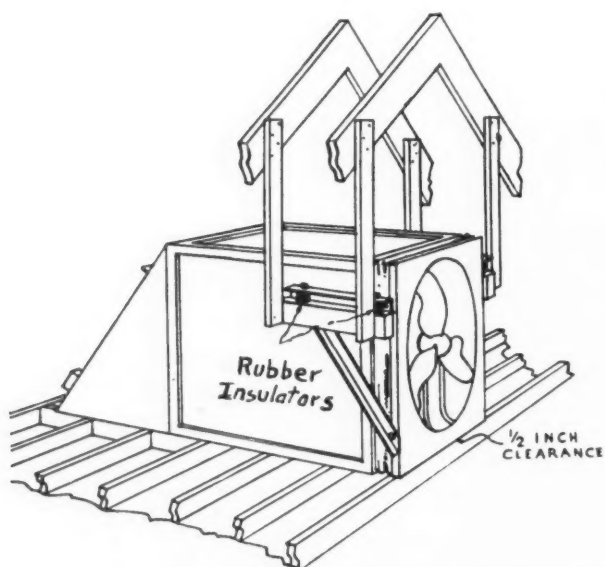


Fig. 10—Where the fan and housing must be suspended from the roof rafters, Viking Air Conditioning Corp. suggests this insulated suspension.

Co. and American Coolair Corp. suspend their fan on springs within the crate when the crate is to form a part of the air duct or by springs when the fan is removed from the crate. A number of other manufacturers leave vibration elimination to the installer.

Installers, generally, have had plenty of trouble during the last five years with this problem of vibration elimination. Fan improvements have helped greatly; better balance (static and dynamic) of the fan; better and stiffer bearings; resilient mounted motors; all have helped to cut down vibration. However, oftentimes the house is so constructed that small movements of a fan set up much larger movements in the structure. These suggestions have come from this experience—

- 1—In an air duct installation always lay a full

floor under fan and air duct, nailing to as many joists as possible.

- 2—Lay this floor above partitions if possible.
- 3—On very long span joists place unit toward one bearing end.
- 4—Separate fan box from air duct by a flexible collar.
- 5—In doubtful cases place a strip of sponge rubber, or other soft material under entire bottom edge of fan box and air duct.
- 6—Place fan several feet from grille opening.

### Exhaust Openings

Attic fan systems having the fan located on the attic floor require adequate exhaust openings. Preferably more than one opening should be employed as two or more openings assist in ventilating the attic by natural air flow and, also, so that one opening is on the side of natural exfiltration. Open windows are frequently used, but arrangements should be made to insure the windows remaining open. Louvred openings are considered preferable by contractors because such openings are always open, keep out rain, can be screened to keep out bugs and birds. Remember, a fly screen reduces the free area of an opening 50 per cent.

Contractors and manufacturers differ as to correct size for exhaust openings. A minimum opening is probably an area equal to the area of the fan. A 30-inch fan with an area of 706 square inches would take an opening of 800 inches. The maximum is probably an area equal to twice the area of the fan. If two openings are used, each opening should be at least equal to the area of the fan.

Quite a number of fan manufacturers have standard sized louvre openings, assembled and framed ready to slip into the wall opening. Belanger Fan & Blower Co., Peerless Electric Co. (automatic shutter), Kisco Co. (automatic shutter), Champion Blower & Forge Co. (automatic shutter), Lau Blower Co. (fixed or automatic), Schwitzer-Cummins Co. (automatic shutter), American Coolair Corp. (automatic shutter), American Blower Co., Reed Unit-Fans, Inc. (automatic shutter), Air Controls Inc. (automatic shutter)—all list louvred openings as equipment.

Some typical arrangements of end wall louvred openings are shown in Fig. 11. Details of louvre construction are shown in Fig. 12.

In the South and Southwest, our "Inventory of Attic Ventilation in Southwest Cities" showed that

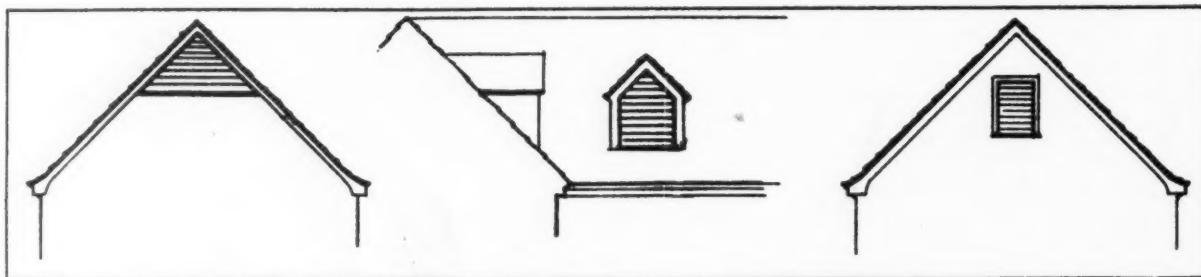


Fig. 11—Some common forms of attic ventilating louvred openings. Drawing from American Blower Co. Manual. Where possible, openings should be near the ridge.

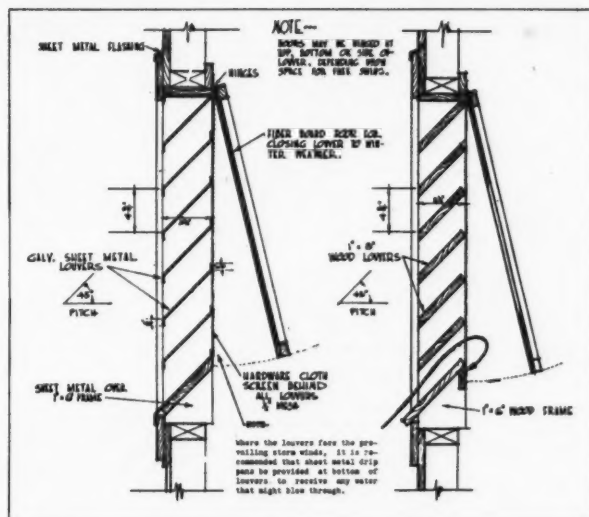


Fig. 12—Suggested construction details for louvred openings, showing flashing and door to be closed in winter. Suggested by American Blower Co.

a favorite method of getting air out of attics is to open the eaves of the roof by cutting long slots or a series of slots between rafter extensions. These holes are screened and have the advantage of

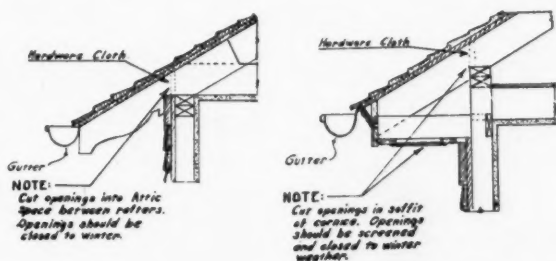


Fig. 13—Two methods for opening eaves (popular in the south) suggested by American Coolair Corp. Such openings must be screened.

natural protection. They are also inconspicuous. Generally the methods of making these openings follow pretty closely the diagrams in Fig. 13.

#### Fire Protection

In some localities attic fan systems (particularly in apartment buildings) are viewed as fire hazards and provision for stopping the fan or shutting off the strong draft through the house is demanded. One practical way to shut off the draft is to build into the grille a fusible link which will melt and drop a door or close shutters between the top floor and the attic. Fig. 6 shows the link in the Robbins & Myers housing. When this link melts the door drops and shuts off the grille. Fig. 9 shows the fusible link installed in the Air Controls, Inc., factory built housing.

To meet some fire laws attic ventilating systems must be so arranged that the fan stops in case of fire. This requires some sort of a thermal cut-out switch wired into the electric line to the fan and so placed that any draft of hot air sucked up by the fan from a fire breaks the circuit and stops the fan. To be effective, this cut-out switch must, of course,

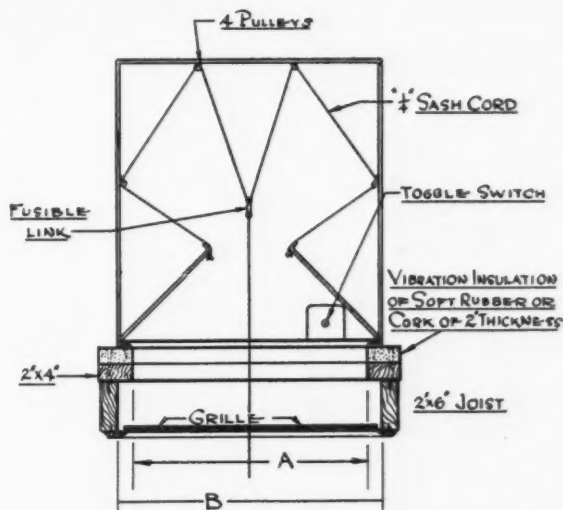


Fig. 9—Air Controls, Inc., furnishes this steel housing, shipped knocked down, and featuring the attic ventilating panels. The fusible link melts in case of fire and closes the grille.

be placed where the air coming through the grille or housing sweeps the unit.

Some contractors have met these fire laws by placing in the air duct an ordinary furnace limit switch wired into the fan circuit and set at approximately 120 to 150 degrees. The element projects into the main air stream so that any appreciable rise in air temperature breaks the circuit and stops the fan. Approximately 25 degrees above highest outdoor temperature seems to work satisfactorily.

Where automatic shutters are used with the grille (see Fig. 14) the limit switch might be placed

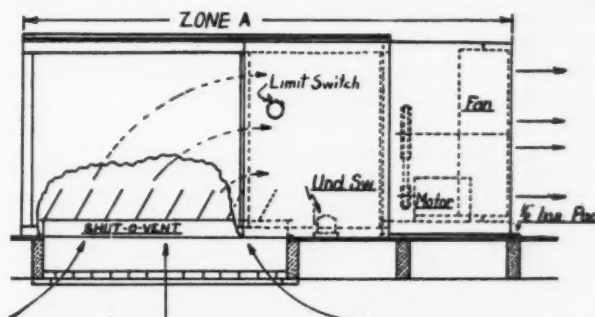


Fig. 14—Reed Unit-Fans (illustration) recommend louvres at the grille. These shut when the fan is idle. In case of fire, a special switch (see text) or a furnace limit control can break the electrical circuit to the fan and thus close the louvres.

almost anywhere in Zone A so long as the element is in the air stream. Fig. 14 shows the air duct of the Reed Unit-Fans. This company furnishes an underwriters fire fuse which is a spring actuated switch and fuse holding the switch in a closed position (electric current flowing to motor) but when a fire starts the fuse blows at 135 degrees opening the circuit, stopping the fan and permitting the shutters to close.

Oftentimes the attic ventilating system is installed in houses where the owner insists that pre-



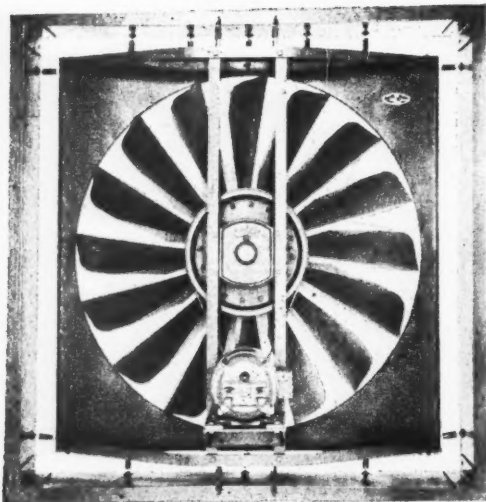
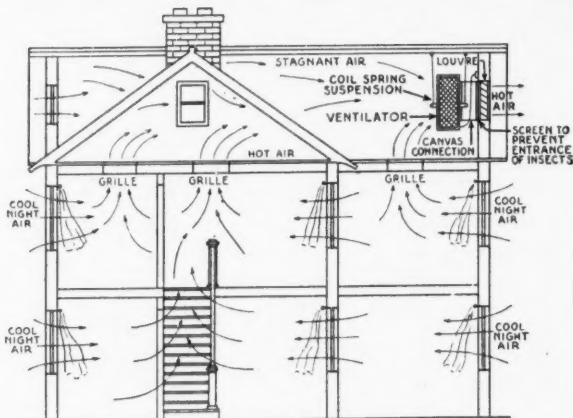


Fig. 17—Left—American Coolair Corp. mounts the fan on springs within the housing and recommends this mounting for end wall installations.

A suggested installation is shown in Fig. 18—right—by Peerless Electric Co.



cautions be taken to shut out cold air in winter. If the attic floor is insulated, it may be well to have attic ventilation to prevent condensation of moisture, but if the owner wants the attic closed, some means must be arranged to shut the exhaust openings and there should also be some way to shut the grille. Fig. 12 shows American Blower door to close the opening. The doors of Fig. 9 (Air Controls, Inc.) also serve to shut the grille.

#### Multi-Grille Installations

A type of installation popular for large houses or apartment buildings, is the system where each room to be ventilated has its own ceiling grille. These grilles are all connected to the fan housing, which usually is a housed unit opening to the attic or through an outside wall. So far as installation goes, there is nothing difficult about the idea. Each grille is sized to keep air velocities below 600 fpm. Each register is connected to the fan housing with round tin pipe (cheapest), round galvanized, rectangular galvanized, or ducts built of the same ma-



Fig. 15—Closed bath-kitchen ventilating system installed by contractor J. E. Peterson, Hinsdale, Ill.

terial used in the fan housing. These pipes open into a box around the fan. The critical problem is noise—air noise through the grilles can be prevented by less than 600 fpm velocities; noise from the fan (vibration or air) can be prevented by setting the fan away from the end of the box into which the ducts connect. Each ceiling register should be valved so the opening can be closed. Fig. 15 shows part of a combination bath room-kitchen ventilation system with round pipes to fan.

#### End Wall Installations

The only attic ventilation system not so far mentioned is that with the exhaust fan mounted in an end wall of the attic. This method is favored for its economy, since no duct work or fan housing is required, but is applicable only where the attic is air tight. The air enters the attic through one or more grilles and both attic air and downstairs air is exhausted in the simplest systems. A more elaborate installation may box the fan and provide a duct from the grille to the fan box with a door which permits attic air to enter the fan box when the attic space is to be exhausted.

The particular problem stressed by contractors is to hang the fan so that any vibration is killed between the fan and the structural members of the house. Manufacturers of fans suited to this type of installation mount the motor on rubber or properly insulate the unit for vibration elimination.

American Coolair Corp. mounts the fan and motor in a steel frame and hangs this frame within a wood frame on springs which hold the steel frame equi-distant from the wood frame. (See Fig. 17). Peerless Electric Co. supply their fan boxed and recommend that for end wall installations the box be suspended from the rafters by springs as shown in Fig. 18. Johnson Fan & Blower Corp. furnish their fan and motor mounted in a circular, steel housing which has springs by which the unit is suspended from the rafters. A canvas collar connects the steel housing with the window or opening. Buffalo Forge Co. depends on rubber motor mountings and resilient fan bearings to prevent noise or vibration. Schwitzer-Cummins suggests that their cabinet blower be placed on large, sponge rubber pads furnished with the unit. The hold down screws are furnished with rubber grommets.

*America's 600-Ton Needle*



**EVERY** year housewives, tailors -- and bachelors -- use 625 tons of steel needles -- and needles are only one of literally countless products of steel on which your life, your comfort, and civilization itself depend.

Eliminate steel in your daily activity, and picture what a dismal existence you would lead. You sleep in comfort on steel springs. You shave with a steel razor, bathe in a steel tub. Your breakfast coffee percolates in a steel pot on a steel range. You ride to work in a steel automobile, street car or train. You work in a steel-framed building, at a steel typewriter, desk or machine. You go to a motion picture made and projected with steel equipment. As a nightcap you may enjoy a glass of beer from a tin-plated steel can.

To carry you comfortably through such a day, hundreds of different kinds of steel are required. To develop these different steels, on which modern life and progress depend, Youngstown has poured millions into research to find better steels, to better serve expanding human needs.

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A NEW AIR DISTRIBUTION OUTLET



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ROCKFORD, ILLINOIS, U. S. A.



# Sioux City, Iowa, Furnace Ordinance [Part 3]

**T**HIS Part 3 concludes the Sioux City ordinance. In answer to inquirers, we are indebted to Alfred R. Wagstaff, chairman of the Examining Committee, for the following resume of mechanical system rules and inspection procedure. Mr. Wagstaff says:

"The furnace ordinance of Sioux City has had several amendments since its passage in 1925. During the year 1935 this ordinance was amended. Then again on January 17, 1936, Ordinance P-11611 amending the original ordinance was passed. This amending ordinance was repealed with the passage of the License and Bonding Ordinance February 26, 1937. Later, July 23, 1937, the Stoker Ordinance was passed.

"The furnace inspector is responsible for the inspection of furnaces, oil burners, stokers, forced air heating systems, and all signs.

"The furnace ordinance, as it now is on the records, applies to mechanical warm air systems as shown in the two paragraphs:

"All air conditioning jobs shall be inspected and a fee of \$1.00 be assessed (private dwellings).

"All blower and air conditioning jobs shall be

governed by the current issue of the American Society of Heating and Ventilating Engineers' Guide.

"You will see that this covers standard practice as set forth in the Guide, and with which all heating men should be familiar.

"Inspection is made in each individual room. The velocity and volume of air and the temperature of the air are taken and the calculation of the room is compared with this test, to see that enough heat is being delivered. The sheet metal work is inspected for neatness and efficiency; the joints for tightness and the general construction; this being for forced air heating. As stated in the ordinance, the Guide is used as the text in approving or condemning a job.

"The inspector is provided with an anemometer, draft gauge, thermometers, psychrometer, and apparatus for testing carbon dioxide percentages. With the above he can step in on any job and give it a complete test. He has also provided himself with a series of charts that cuts his time on each inspection considerably."

## Ordinance No. P-15259

An ordinance to prescribe rules and regulations for the installation, repair or remodeling of any stoker or stoker equipment, and to provide for and fix the fees for the inspection of stoker installation, repair or remodeling in the City of Sioux City, and to provide for the issuance of permits therefor, and to further provide for the examination and licensing of Combustion Engineers, fixing the fees to be charged for the license and fixing the amount of bond to be required, and to provide for the enforcement of the provisions of this ordinance and to prescribe penalties for the violation thereof.

### Be It Ordained by the City Council of the City of Sioux City, Iowa:

Section 1. No person, firm, partnership or corporation shall install, repair or remodel any stoker or stoker equipment in Sioux City without first having obtained a license from the office of the City Clerk and a permit for the work to be done from the Building Inspection Department, and said permit must at all times during the process of installation of such work and until completion thereof, be posted in some accessible place in the building in connection with which the work is being done. Any person, firm or corporation installing, repairing or remodeling stoker equipment shall have a resident service man and such person, firm or corporation shall first obtain a license.

(a) Bond. When the Furnace Inspector is satisfied, through oral examination or otherwise, as to the applicant's fitness and standing relative to his ability to install and repair stokers, according to the requirements of this ordinance, and his reliability as to completion of previous work and his record in connection with proper performance of previous contracts he shall notify the applicant to file with the City Clerk a surety company bond to be approved by the City Council in the sum of Two Thousand Dollars (\$2,000.00) in favor of the City of Sioux City. Such bonds shall be conditioned on the faithful performance of all duties required by ordinance, rule or regulations of the City of Sioux City, Iowa. It shall be a further condition of the said bond that the obligator will hold the City harmless from all damages sustained by reason of neglect or incompetence on the part of any such person, firm, partnership or corporation in the performance of work done.

(b) License. Upon approval of such bond by the City Council, the said Council may, upon recommendation of the Furnace Inspector, issue to the applicant, through the City Clerk, a license for one year, or any part thereof, upon payment of Twenty-five Dollars (\$25.00) license fee.

(c) Renewal of License. Renewal of the license shall be made by the City Council, through the office of the City Clerk, upon the payment of Twenty-five Dollars (\$25.00) in advance on the first of April of each year thereafter.

(e) Before the issuing of a permit for the installation, repair or remodeling of a stoker, the Furnace Inspector may require specifications and description of the proposed work, and there shall have been paid into the Department of Building the following permit fees:

Domestic Stoker, 10 lbs. to 100 lbs.....	\$2.50
Commercial Stoker, 100 lbs. to 300 lbs.....	3.50
Industrial Stoker, 300 lbs. to 1200 lbs.....	5.00
Bin Feed Stoker, Domestic.....	3.00

Section 2. Stoker Defined. The term "stoker" shall, for the purpose of this ordinance, be taken to mean a mechanical device for feeding solid fuel into the combustion chamber of a boiler or furnace used in connection with a heating plant or power plant, whether automatically or manually controlled.

Section 3. Non-Automatic Stokers. Stokers which are not equipped with automatic means of preventing excessive pressures or temperatures of the heating medium shall not be installed or operated in any location unless a licensed attendant will be constantly on duty on the premises while the stoker is in operation.

Section 4. Automatic Controls. Except as provided in Section 3 of this ordinance, no stoker installation shall be made in a hot water boiler or warm air heating furnace without a high limit control, or in a steam heating boiler without a low water cut-off and an approved type of a pressure control so as to shut off the power from the stoker drive in the event of excessive temperatures or low water in steam boilers.

Section 5. Electric Wiring and Equipment. Electric wiring and equipment in connection with stoker installation shall be installed in accordance with the provisions of the Ordinance No. N-942, "An Ordinance Regulating the Installation, Opera-

(Continued on page 96)

For your convenience a number has been assigned each item. Check the items in which you are interested on the coupon on page 102 and mail to us. Complete information will be forwarded.

● Indicates product not listed in 1938 Directory.

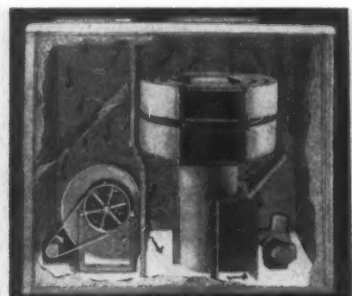
△ Indicates product and manufacturer not listed in 1938 Directory.

# NEW PRODUCTS

## ▲ 153—Radiation Furnace

The Michigan Fireproof Skylight Co., Benton Harbor, Mich., after two years of experimentation, announces their new Radiation furnace designed for oil and gas. This company invites oil-burner and heating engineers to study this development in design.

The upper radiator unit has three different size flues to equalize the heat release. This unit has 5,376 sq. in. of



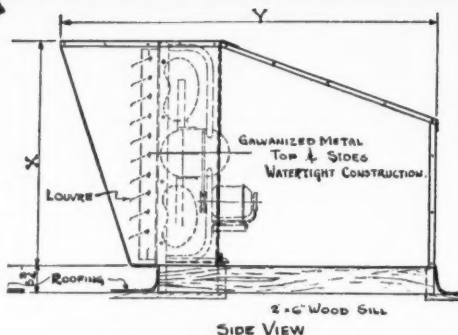
heating surface. The second radiation unit has 4,800 sq. in. of heating surface. The two units together have 10,176 sq. in. of heating surface. The complete 20 in. furnace has a total of 13,376 sq. in. of heating surface. A third radiator can be attached as a fuel saver for a gas unit. Among the other important features are the large openings provided for flue cleanouts.

This Radiation furnace is to be built in 20, 24 and 28 in. sizes and will be sold at a low price.

Sidney Volk with 34 years of experience in the furnace line, is the designer.

## ● 154—Roof Scrapers

David Levow, 308 West 20th Street, New York City, is putting on the market a new "Fitrite" roof scraper with interchangeable heads for 3 and 6-inch blades. The blades are held tightly by the malleable iron plate, exposing only a small portion of the blade. After one edge is worn, the blades can be reversed.



## 155—Roof Ventilator

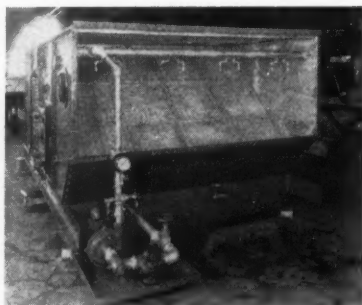
Viking Air Conditioning Corp., Main & Center St., N. W., Cleveland, announces the Viking roof ventilator. This new model combines the popular Viking exhaust fan and Viking automatic shutter in a weather-tight pent-house of Armco galvanized iron.

The sloping top of the pent-house and ample space between its back and the fan unit permits a large volume of air to be drawn through without turbulence and with minimum resistance. The extended part or cowl effect in front of the shutter enables operation in rainy weather.

Three sizes are available, suitable for restaurant, bakery or club.

## ▲ 156—The Capillary

Air & Refrigeration Corp., 11 West 42nd St., New York City, announces the Capillary air conditioning unit built



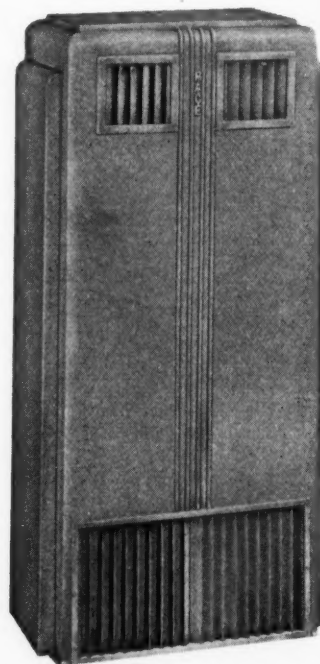
on new principles. The Capillary Conditioner may be used either as a humidifier or as a dehumidifier in conjunction with assemblies of standard apparatus in any general type of air conditioning system.

The Capillary Conditioner cleans the air besides conditioning it.

The complete conditioner consists of a shallow collecting tank under the entire arrangement of cells; casings above the tank for enclosing the cells and to form a conduit through which air is passed; frame work for supporting the cells proper; piping and nozzles for distributing water over the cells; and eliminators at the leaving end for removing the small amount of entrained moisture. At the entering end baffles, perforated plates or screens can be installed for properly distributing the air over the entire cross-sectional area of the humidifying chamber.

## 157—A. C. Circulator

Royal Air Conditioning Equipment Company of Compton, Calif., announces a self-contained winter air conditioner-circulator designed to fit in room corners, and to blend with the modern trend in home decoration.



The new unit—20 x 13 x 49 in.—comes in four distinctive finishes, can be operated without ducts, and features venetian air grilles for the directional flow of air delivery.

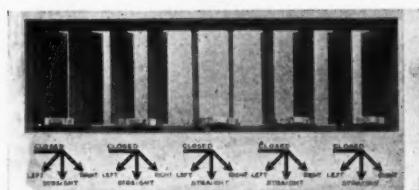
According to J. H. Moore, one of the organizers of the company, the new Race unit will supply heat and filtered air for from 5,000 to 7,000 cu. ft. of floor space. It is completely automatic, with switch for summer operation.

The Race line consists of nine sizes—45,000 to 630,000 Btu input.



# New Products . . . . .

For your convenience in obtaining information regarding these items, use the coupon on page 102.



## 158—Battery Register

Register & Grille Mfg. Co., 70 Berry St., Brooklyn, announces the Battery register, with multiple shutters (each 2-in. wide) arranged with two or more shutters operated as a set, independently of the others. Each set of shutters can be operated from a closed position over a range of 135 deg. and all adjustments can be made without removing the face. Any type of face can be attached to Battery shutters, operated either by wheel, key-lock, or knob.

## 159—Window Ventilator

Air Controls, Inc., Cleveland, O., announces a new window ventilator known as the model WFJ-208 Rex-Airate. This new unit is designed for homes and apartments, offices, hotel rooms, hospital rooms, and other small business establishments. It can be quickly and easily installed in any standard sized window, and is also



adapted to transoms. Place it on the window sill, adjust the metal window fixtures, close window to top of the unit and plug into any electric socket.

The dark brown crinkle and cream baked enamel finish presents an attractive appearance to the interior of any room. This new unit can be moved from window to window, to another room, or to a new address.

Furnished complete, ready to install with 1/4 hp. Century Long Hour Service type motor, grille, fixed louvers and metal fixture mountings. Capacity: 2,850 cfm.; size: approximately 23 by 23 by 16 1/2 in.

## 160—Overhead Furnace

Gasconaire, Inc., 3255 Goldner Ave., Detroit, has put on the market a complete gas-fired heating system—the Overhead Gasconaire—suspended from the basement ceiling.

The Overhead Gasconaire heats by means of warm air and operates automatically. The heated air is driven over the heat-radiating unit to the registers, through ducts, by a direct-driven multi-speed blower. The return air passes through four filters before being again sent over the heating unit. The blower has no pulley or belts, it is quiet and flexible. The turn of a button changes the speed.



The heating unit inside the trunk is made in fin-type design of Armco Ingot Iron. Gasconaire special gas burners of dual chamber design extend along the inside of the heating unit.

Electric ignition is fully automatic.

The temperature above the unit at the joist space never exceeds 85 degrees. Installed in the top of the trunk is one-inch air cell insulation.

The unit is thermostatically controlled and is provided with an automatic humidifier.

The plant can be used in summer as a pleasant air-circulating system simply by operating the blower.

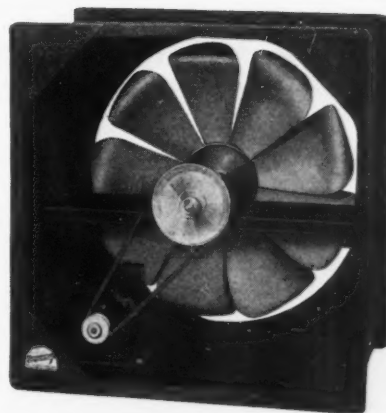
In addition to overhead installation in the basement, the Gasconaire can also be installed in homes without basements, either in the attic, beneath the floor or in the utility room.

The Overhead Gasconaire is approved by the American Gas Association Laboratories.

## 161—Pyrolite Products

The Pyrolite Products Co., 1221 West 74th St., Cleveland, announces the following new products—Pyrolite high grade tinnings red, special tinnings red, ready-mixed aluminum paint, caulking compound, heat resisting black, black plastic roof cement and pipe joint compound.

Price lists are available.



## 162—Economy Attic Fans

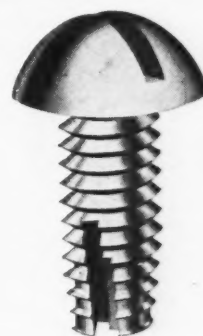
Economy Electric Mfg. Co., 4605 West 21st Place., Chicago, announces box type attic fans designed especially for home service, easy to install and operate. The box type frame simplifies construction of vent box.

Economy attic fans have many blades, which operate slowly, for more volume of air, with negligible use of power, and balanced bucket type fan blades for greater efficiency—equipped with rubber mounted ball bearings and belt driven for quiet and efficient operation without vibration.

Rigid steel frame and motor support are electrically welded in one piece assuring permanent alignment and easy installation. A.C. 1 phase 60 cycle, 110 volt motor.

## 163—Thread-Cutting Screws

The Shakeproof Lock Washer Company, Chicago, announces the development of the new Shakeproof "Hi-Hook" thread-cutting screw, developed for plastic materials.



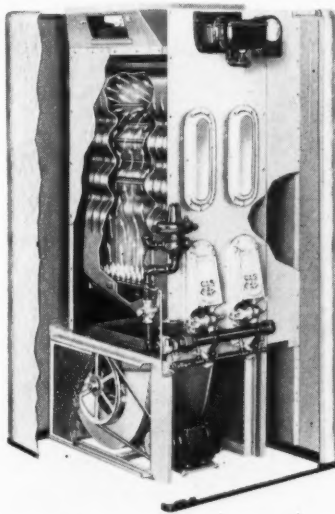
A specially designed double width slot gives an acute cutting edge that cuts a clean, sharp thread in all types of plastic compositions, both molded and laminated. This construction materially reduces the high driving torque normally encountered and enables fast, easy driving with a minimum of the breakage common to molded plastics.





# New Products . . . . .

For your convenience in obtaining information regarding these items, use the coupon on page 102.



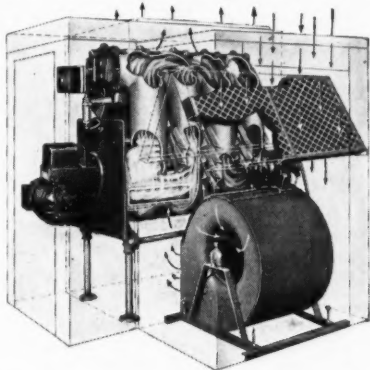
## 169—Climatrol Junior

The L. J. Mueller Furnace Company, Milwaukee, announces Climatrol Junior, a new lower-priced gas-fired winter air conditioning furnace, designed and built for the smaller home, and offering homeowners the combined comforts of gas heat, circulation, air cleaning, and humidity at a low price.

The complete unit is housed in an attractive green texture-lacquered cabinet—68 x 40 x 31½ in. for the smaller size—the larger size runs 45 in. in width. There are two sizes, the SP-2 with an input rating of 90,000 Btu's per hour, and the SP-3 with 135,000.

## 170—Oil Air Conditioner

The Excelsior Steel Furnace Co., 114 S. Clinton St., Chicago, announces the Excelsior Unique oil-burning air conditioner—a specially designed oil



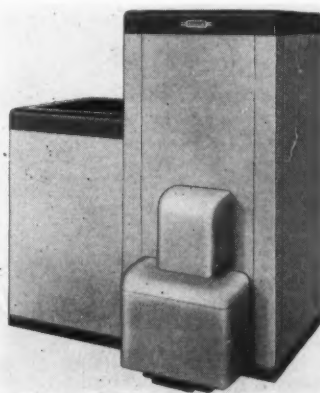
burner, precast combustion chamber, Unique all-cast heating element, over-size multiple-blade blower, automatic control system, automatic humidifier, large filter, and an attractive, well insulated casing in green or vermillion.

The heating element is made in sections, each section a one-piece casting of chrome-alloy cast iron ¼ inch thick.

The burner is the pressure atomizing type, designed to fit the unit.

## 171—Oil-burning Conditioner

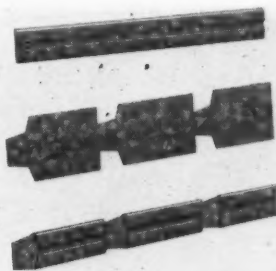
The Oil Burner Division, Gilbert & Barker Mfg. Co., Springfield, Mass., announces a new low-capacity winter air conditioning unit both for the small home and limited pocket-book—Model FBSA80. The welded steel furnace is of heavy gauge metal. The radiator is specially designed and constructed to insure maximum heating efficiency.



Its pleasing two-tone green finish harmonizes with present day basement color and the compactness of the unit is noted in the overall dimensions of 54 in. wide by 30 in. deep by 63 in. high. The capacity is 80,000 Btu per hour at register. The blower, operated by a quiet, low operating cost ¼ H.P. motor, contains four large surface filters 15 x 20 x 2 in. thick.

## 172—Drive Cleats Cheaper

The Whitney Metal Tool Company of Rockford, Illinois, is suggesting to sheet metal men a way to cut labor cost 89 per cent in the manufacture of drive cleats by combining the use of a Kick Press, equipped with a special notching punch and die, with the No. 75 Duplex Rolling Machine.



Most of the work is done in the shop by apprentices. Blanks are punched out on the Kick Press at intervals set to correspond with the standard lengths of cleats desired. These blanks are then put in the rolling machine and the sides folded in accurately to form the cleats. The long strips, notched to various lengths, are put in stock and delivered to the job as required.



## 173—P & R Air Conditioner

Pernot and Rich, Inc., 2546 San Fernando Road, Los Angeles, offers the P & R air conditioner for cool, dry, filtered air. There are six models ranging from 1/6 to 1 horsepower with air delivery of from 250 to 2,000 cfm. Units for commercial applications are available in sizes from 2,500 to 30,000 cu. ft. per minute.

These units operate on the principle of indirect evaporation.

The unit has two sets of unconnected tubes. Through one set of tubes a blower pulls air which has passed through the water spray at the top. Evaporation takes place in the spray chamber and in the tubes resulting in cool tube surfaces. The theoretical temperature is the wet bulb temperature of the air passed through the sprays, but mechanical limitations reduces this cooling to 75 to 78 per cent of the air's wet bulb temperature. The air from and to the space cooled is blown by another blower through the second set of tubes and, because these tubes are formed by the spray tubes, the tube surfaces are cool but dry.

Straight ventilation can be obtained by shutting off the sprays and the evaporative air stream blower. Also, by heating the spray water the unit can be used for some degree of heating.

## 174—Non-Discoloring Enamel

Wipe-On Corporation, Industrial Division, 105 Hudson St., New York City, offers a non-discoloring enamel in white or pastel tints and darker colors that will stand temperatures of over 1,000 deg. F., without discoloring even in white, and suitable for finishing direct-fired and warm air furnaces and boilers. This product dries by polymerization instead of oxidation or evaporation. The surface resembles porcelain in appearance and hardness, yet it is said to be so tough that it wears longer. It has good resistance to grease, soap, alkali, acids and solvents.

## New Products . . . . .

For your convenience in obtaining information regarding these items, use the coupon on page 102.



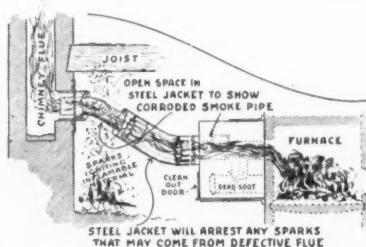
### •175—Lime Remover

Skuttle, 999 Franklin St., Detroit, is offering a lime-remover to eliminate all lime deposits in the water and keep the working parts of the humidifier free from the slime and scale that causes faulty operation and insufficient humidification in the home.

The Lime-Remover is easily installed between the joists near the line.

### ▲176—Fire Protecting Jacket

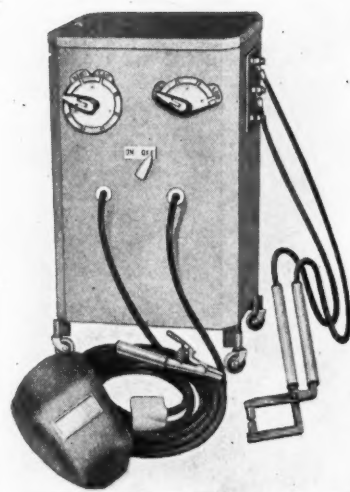
G. M. Cook of 514 Jones Bldg., Pittsburgh, has invented a combination fire protective jacket and sleeve for the waste gas pipe on furnaces—a galvan-



ized steel jacket to cover furnace smoke pipes or stove pipes.

The jacket has an air space between it and the smoke pipe, and can be applied to new or existing furnaces and stove pipes.

The jacket is being built for Messer Bros., 7325 Kelly St., Pittsburgh by C. E. Glessner, vice president of the Excelsior Steel Furnace Co., Chicago.



### 177—Arc and Spot Welder

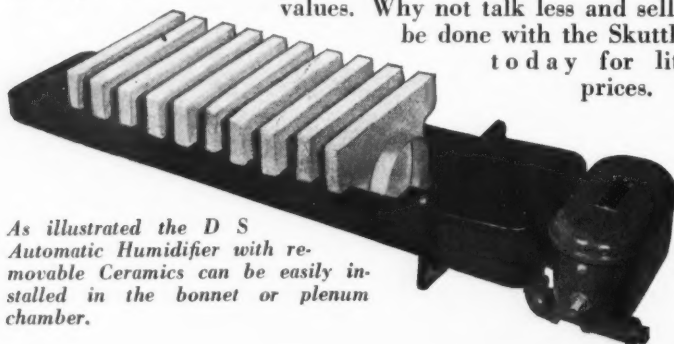
Miller Electric Mfg. Co., Appleton, Wis., announces a combination arc and spot welder. The spot welder is built into their regular No. 2, and No. 3 welders, with capacities of 165 amperes for the No. 2 and 220 amperes for the No. 3. These units are designed to provide arc welders of ample capacity to handle electrodes from  $\frac{1}{8}$  to  $\frac{1}{4}$  in., and have 32 heat controls, enabling the operator to weld from the lightest to the heaviest metal, and with the addition of the spot welder will handle all sheet metal work. The spot welder has a number of heat controls for different thicknesses of metal.

*Talk is Cheap..*

**... and not always convincing!**

• It takes a lot of talk and sound argument to close most sales, but we believe that top-notch performance and a fair price will convince most prospects that Skuttle's automatic humidifiers are outstanding values. Why not talk less and sell more, it can be done with the Skuttle line—write today for literature and prices.

As illustrated the D S Automatic Humidifier with removable Ceramics can be easily installed in the bonnet or plenum chamber.



SIZES:  
30" and 20"  
units. Also  
special sizes.



### LIME REMOVER

Skuttle's Lime Remover will eliminate all lime and scale that collects in the humidifier pan. Here is a hot accessory for your humidifier line. Size height  $12\frac{1}{2}$ " diameter  $6\frac{1}{2}$ ".

WRITE TODAY FOR

J. L. SKUTTLE COMPANY

**Skuttle**  
AUTOMATIC HUMIDIFIERS

INFORMATION

999 FRANKLIN ST., DETROIT, MICH.

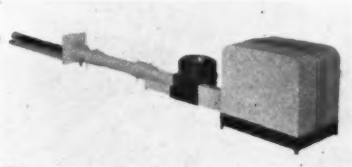


# New Products . . . . .

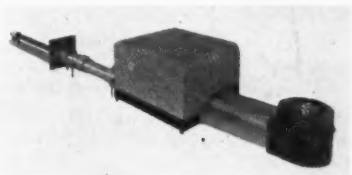
For your convenience in obtaining information regarding these items, use the coupon on page 102.

## 178—Bin-Feed Stokers

Econ-O-Col Stoker Division of Cotta Transmission Corp., Rockford, Illinois, announces two new Econ-O-Col bin-feed stokers.



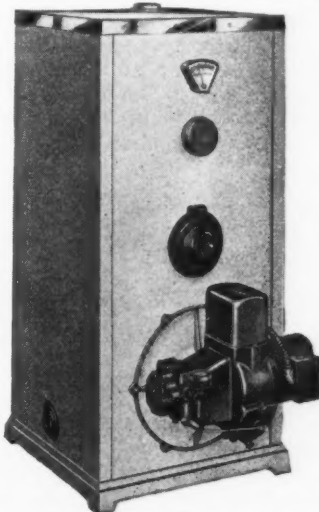
The "Pull-thru" model requires two openings in the sides or front and back. Coal is conveyed direct from bin.



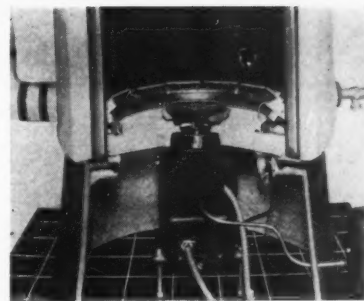
In the "Transfer" model, the coal is conveyed from the bin to a point directly under the power unit, then transferred to a second feed screw and requires only one entrance to furnace.

## 179—Aqua Master

Century Engineering Corporation, Cedar Rapids, Iowa, is offering a new flueless water heater—the Aqua Mas-



ter—as a companion unit to the Century Zeph-O-Lator warm air furnace unit. Comes complete as a cabinet unit, finished in baked wrinkle enamel—red, green or brown.



## 180—Low-Price Burner

Timken Silent Automatic Division, The Timken-Detroit Axle Company, Detroit, announces a new conversion wall-flame oil burner at a low price. The new burner, known as the Model F, is rated at 575 sq. ft. of EDR steam, and has an oil rate of from 5 to 10 pounds of oil per hour. The burner uses either No. 1 or No. 2 fuel oil.

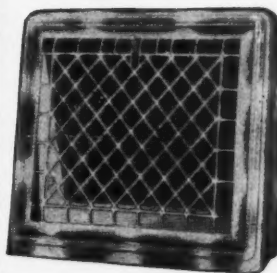
T. A. Crawford, General Sales Manager, says the Model F burner has all of the Timken features found in the larger and higher priced burners in the line. "In addition, Timken engineers have perfected a new type of motor and oil distributor called the 'Mono-Rotor.' This one moving part of the burner is both the rotor of the motor and the oil distributor. The shaft of the 'Mono-Rotor' is lubricated by the fuel oil flowing through the burner.

"The Model F has a new type of chromium steel flame-rim which is installed in one piece."



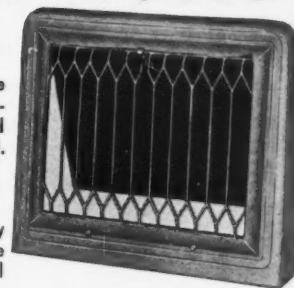
**REGISTERS  
AND GRILLS  
FOR  
EVERY HEATING  
AND  
AIR CONDITIONING  
NEED**

## "TOPS" for ALL GRAVITY JOBS



### NATIONAL (Left)

National Registers are the favorites everywhere an inexpensive neat diamond lattice design is desired.

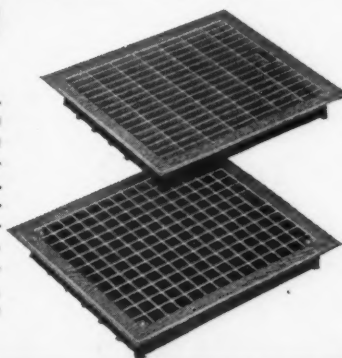


### PANAMA (Right)

Modern beauty and easy installation features make this the most popular of all Bar-Type Design Registers.

### THE BEST IN FLOOR REGISTERS

The U. S. TRUSSTEEL Floor Register (top) with patented bar suspension Affords Heel Proof Feature—and the U. S. STEEL EMBOSSED Floor Register, "world's strongest"—both with natural photographic wood grain—bring new beauty, strength, and value in floor registers.



U. S. Efficient high speed production methods give you the greatest values in the industry.



**UNITED STATES REGISTER CO.**

BATTLE CREEK, MICHIGAN

MINNEAPOLIS • KANSAS CITY • ALBANY • SAN FRANCISCO • NEW YORK, N. Y.

## New Products . . . . .

For your convenience in obtaining information regarding these items, use the coupon on page 102.

### ▲181—Insto-Gas Torch

The Insto-Gas Corporation, 1900 E. Jefferson Ave., Detroit, announces a new type torch especially designed for light brazing, electrical soldering, sheet metal soldering and copper pipe fittings up to  $\frac{3}{4}$  in. in diameter.



The new Insto-Gas torch eliminates the danger of burned spots so frequent with the high-temperature, concentrated type of flame. Overheating burns the flux inside the fitting, causing oxidized areas to which the solder

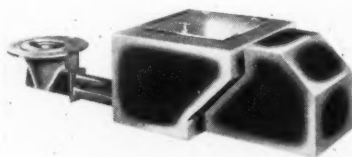
will not adhere and leaves a deposit of burned flux that looks like dirt.

Temperatures up to 2500 degrees F. may be had with this new torch.

### 182—Challenger

Kol-Master Corporation, Oregon, Illinois, introduces its "Challenger."

Burning capacity of the Challenger is from 6 to 40 lbs. per hour—adequate for any domestic installation.



Hopper, just 22 in. high for easy clearance under any standard firebox door, is centered directly on the feed screw; has 300 lbs. capacity. The Challenger is of steel construction throughout—except for retort and dead plates. The use of dead plates in place of refractory hearths eliminates excessive temperature in vicinity of the retort and makes it practical to use special 1-piece tuyeres which virtually do away with windbox siftings.



### 183—Heavy Duty Shear

The Beverly Shear Co., 3009 West 110th Place, Chicago, is offering their B 3 "Heavy Duty" Beverly Throatless Shear which they say is capable of cutting  $\frac{1}{8}$ -gauge mild steel or 10-gauge stainless steel, efficiently and effectively. Weight 55 pounds.

The body is made of high grade chrome-nickel steel. The blades are made of high-carbon high-chrome steel and are easily adjustable for wear and quickly interchangeable. The outstanding feature claimed is the "Hold-down" which increases the stability of the unit in acting as a guide.



### You Can Whistle While You Work

and turn out more work in less time  
at lower costs with

### NIAGARA POWER SQUARING SHEARS

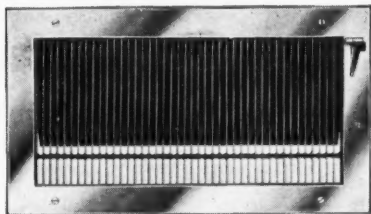
This Series BL, 10 gage Shear is just one in the complete line of Niagara Power Operated Machines to fit the requirements of your shop. Write for catalog.

**NIAGARA MACHINE & TOOL WORKS**  
637-697 Northland Avenue Buffalo, N. Y.

## There's *Economy* in COMBINATION Orders

Another sound reason for standardization on T & B registers, grilles, return air intakes! You can fill **all** your requirements for gravity and air conditioning outlets from this same source and orders can be combined for greater economy.

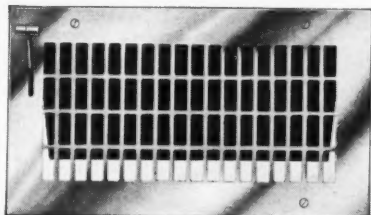
### AIRLINE REGISTER



Close bar construction. Fixed air deflection. Modern and attractive. Economical.

### ECONOMAIR REGISTER

Large effective area. Dignified and unobtrusive. Very low in cost.

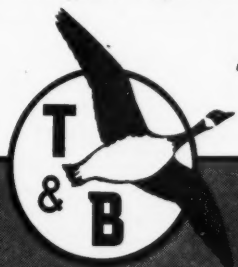


### GRAVITY BASEBOARD REGISTER



Face is easily and quickly removable. Damper opens a full 90°. Friction hinge on damper adjustable with turn of screw driver.

Above are illustrated a few items of our complete line of Air Conditioning and gravity registers. All popular sizes constantly in stock for immediate shipment. Send for Catalog No. 38R.



"THE STANDARD OF  
COMPARISON"

**TUTTLE  
&  
BAILEY INC.**

NEW BRITAIN, CONN.

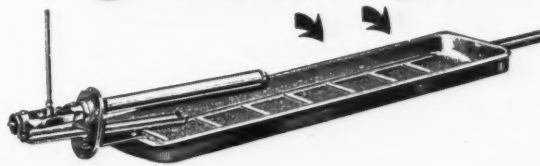
BOSTON

NEW YORK

DETROIT

CHICAGO

## WHY THERMO-DRIP HUMIDIFIERS ARE BUILT WITH *Stainless Steel*



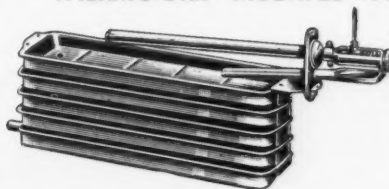
There is infinitely more to the job that's ahead for the pan of the humidifier you install than merely serving as a water receptacle. And perhaps no phase of that job is more important than safeguarding your reputation and protecting your hard-won profits.

To assure better performance season after season and thus give you this protection, Thermo-Drip Humidifiers come equipped with vapor pans of STAINLESS STEEL. You need the positive immunity to rust and the high resistance to corrosion possessed by this tough metal for un-failing service and long pan life. You need the lightness which stainless steel affords for these pans for highest heat transfer and in turn, the most efficient evaporation. The public knows what stainless steel is and does, and you, of course, want the quality appeal of this kind of vapor pan for easier sales and quicker profits.

Only Thermo-Drip Humidifiers have pans of stainless steel. This quality feature is undeniably worth a lot of money—and you might seem justified in assuming that it costs quite a lot. *But it doesn't.* Allowing yourself a substantial profit, you can install a Thermo-Drip Humidifier in the average home generally for less than it takes for some other types with pans of metal that rusts, corrodes and steals profits. So, install Thermo-Drip Humidifiers . . . save time, save money, save regret.

Ask for descriptive folder TODAY.

### THERMO-DRIP MULTIPLE PAN MODELS



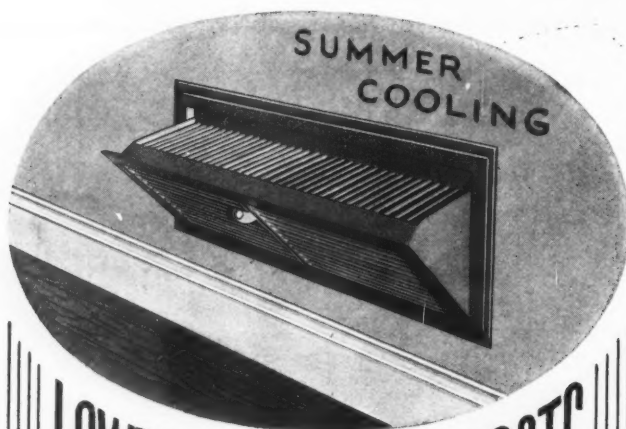
definitely solve the problem of installing an efficient humidifier in furnaces with plenums. Available in a variety of pan sizes.

## AUTOMATIC HUMIDIFIER CO.

18th and Main Streets

CEDAR FALLS, IOWA





## LOWER INSTALLATION COSTS with the NEW "All Season" Combination A/C Register

U. S. PAT. No. RE 20,778

The "ALL SEASON" COMBINATION REGISTER reduces installation costs to a minimum on new or change over jobs.

Saves cutting into sidewalls—allows for use of existing duct systems with no changes or additions.

For winter heating the grille bars are set at 22° downward to allow for uniform air flow across the floor. For summer cooling the grille bars are individually adjustable to provide easily and quickly any air deflection required.

For use on every fan or blower heating installation for partial summer cooling and to provide for future addition of complete mechanical cooling.

Available in both flush wall and baseboard replacement types.

Ask your jobber or write for Catalog D-4

**ECKENROTH REGISTER CO. INC.**  
447 SUTTER ST. SAN FRANCISCO, CALIF.

## NO OBJECTIONABLE DRAFTS



## Association Activities

### Inflammable Materials

National Secretaries' Conference, representing air conditioning, ventilation and heating, sheet metal and roofing work and allied industries, met in Buffalo, New York, on July 16 and adopted the following resolutions:

#### RESOLUTIONS ADOPTED at the

#### BUFFALO, NEW YORK CONFERENCE

Whereas, one of the chief purposes of this Conference is to advocate and to assist in compelling correct practices in the building industry, and

Whereas, it has been brought to the attention of this Conference that some architects and contractors are recommending and are actually using combustible or inflammable material in the erection and installation of Air Conditioning and Ventilating systems, and

Whereas, we feel that such practice is and creates an absolute hazard to the life and health of the public generally, and

Whereas, we know that the National Association of Fire Underwriters are most emphatically opposed to the use of, and are unalterably in favor of the elimination of the use of all inflammable materials in the construction of ducts, boxes and/or pipes used in the installation of air conditioning and ventilating apparatus and/or equipment, Now Therefore,

Be it Resolved, that we, the National Secretaries' Conference, a body of men composed of State and Sheet Metal Contractors' secretaries, recommend to, and we urge, all state and local associations in our industry, to promote and to foster Federal, state and local legislation which shall make unlawful the use of any and/or all inflammable materials in the construction of, and/or the erection of and all such apparatus and equipment as hereinbefore described, and be it further,

Resolved, that a copy of these Resolutions be forwarded to several Trade Journals in our industry, and that we pray their support and assistance in promoting such legislation, and be it further,

Resolved, that a copy be sent to state and local association secretaries whose addresses are available to our secretary.

Respectfully submitted,  
Henry C. Bitter,  
Chairman, Resolutions Committee

#### Chicago

The Annual Basket Picnic of the Furnace-Air Conditioning, Sheet Metal Institute was held on Sunday, July 31, at Long Lake Park, Illinois.

Those who attended enjoyed the races, ball games, horse-shoes and dancing. There was plenty of beer for the grown-ups; and ice cream, crackerjack and pop for the kiddies. Everyone had a good time and are looking forward to next year's outing.

R. H. Guenther, A. Gisiner, L. Drehobl and John Novak all joined hands to make the picnic a great success.

#### Chicago

The Chicago Furnace Sheet Metal Golf Association is again in full swing, and the balance of the season's program follows:

Oak Hills ..... August 18  
Olympia Fields (Cup Day) ..... September 1

On each of these days blind bogey prizes will be given, and finally the association hopes to have a regular prize day, including the play-off for the Championship Cup at the Olympia Fields Country Club.

The association is run very definitely on a "not for profit" basis in the interest of eliminating any unnecessary expense.

Officers are: Louis Drehobl, president; John Spitzer, vice president; C. Den Besten, secretary; and John Novak, treasurer.  
Paul M. Barth, Secretary.

PLEASE THE OWNER...

MAKE MORE PROFIT

Sell These Approved

**G-A**

TEMPERATURE CONTROLS

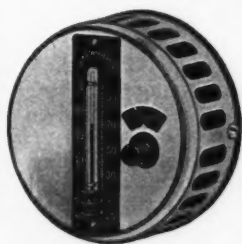


G-A Temperature Controls are approved by Anthracite Industries Laboratories and by the Underwriters' Laboratories—because they're safe, sensitive, outstandingly reliable. They're approved by dealers everywhere—not only for their high quality—not only for the lasting satisfaction which they insure to owners—but because they offer both dealer and jobber a wider margin of profit on every installation.

G-A Controls have been proved by years of hard usage in thousands of installations. Contractors and heating engineers recommend them for trouble-free performance. Check the complete G-A line at your jobber's. Or write for full details.

**FAN SWITCH**

This compact, reliable instrument operates the circulating fan in Forced Warm Air Systems. Can be used in any two or three wire circuit using either high or low voltage current. A snap action, single pole, double throw, double break switch operates between pure silver contacts held firmly together until the instant of breaking. Readily installed, easily adjusted. Also available as Immersion Water Switch.

**THERMOSTATS—SINGLE and DOUBLE**

G-A Low Voltage Thermostats are unsurpassed in sensitivity and dependability. The unique design of the base, which permits a free circulation of air, contributes to its immediate response to temperature changes.

Each instrument is tested and calibrated before leaving the factory, but can be easily adjusted in the field by a simple nut adjustment.

**CONTROL MOTOR**

G-A Control Motors are designed for use on draft and check damper controls, and can also be used on mixing dampers, gas valves and similar equipment. No outside transformers, dust-tight case. Rust proof. Powerful. Sturdy. Altogether dependable.



WRITE TODAY FOR COMPLETE CATALOG AND PRICE LIST OR SEE YOUR JOBBER

**GLEASON-AVERY, INC.**

Auburn, New York

**MONCRIEF STEEL FURNACES**

Moncrief leads in steel furnaces,—in design, in construction and in completeness of the line. Three types, "S," "D," and "E," fulfill every need in any price range. Points of excellence are heavy gauge O. H. copper bearing steel, welded joints, high grade firebrick, improved grates, with oversize finely finished casings. Write for literature and prices.

**THE HENRY FURNACE & FOUNDRY CO.**

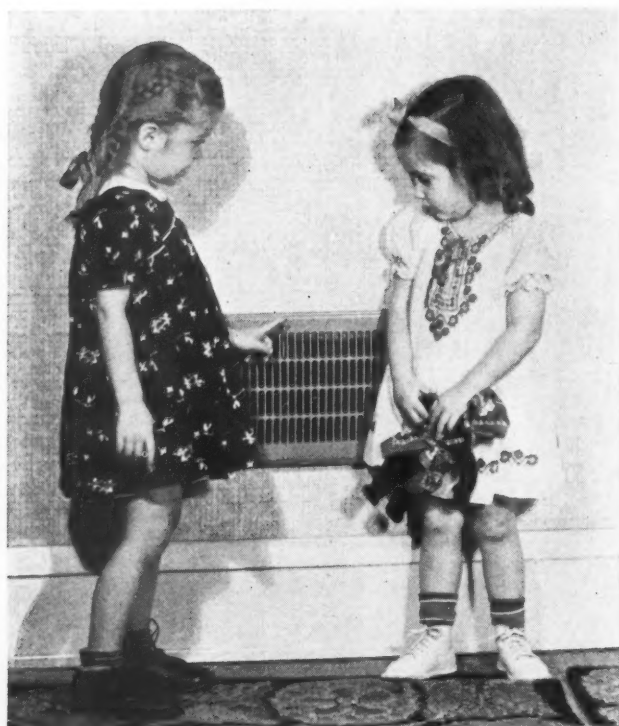
3473 E. 49th St., Cleveland, Ohio

*Manufacturer of*

Winter Air Conditioners for Gas, Coal and Oil, Cast and Steel Furnaces; Air Conditioning and Gravity Pipe and Fittings.

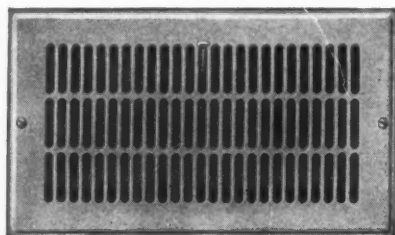
# FINGER-TIP CONTROL...

Another AUER  
"CLASSIC" Feature



The valves on Auer "Classic" Registers WORK EASILY, with instant response to a finger touch. When set, they, STAY in place. Any register is a nuisance if its operating device sticks and balks. Smooth operation is just another WORTH-WHILE feature of all Auer Registers. You don't have to "heave-ho" with a crowbar.

For sheer beauty, the "Classic" face is widely preferred by leading architects and interior decorators. There are many other popular AUER designs of Registers, Intakes, Grilles—such as DuraBilt cross-bar-constructed Floor Registers and Intakes, and Dura-Flo and Fin-Flex Air Conditioning Registers. Ask for complete catalog.



No. 2032 CLASSIC for WALL

The Auer Register Co., 3608 Payne Avenue, Cleveland, Ohio

**AUER** DISTINCTIVE **REGISTERS**  
& GRILLES  For Air Conditioning and Gravity

## Association Activities

### Fox Valley

Conflicting dates and rain until 12:30 held down the attendance of the Annual Field Day of the Fox Valley Furnace and Sheet Metal Contractors Association held Wednesday, July 13, 1938, at Bartlett Hill's Country Club, Bartlett, Ill.

Thirty members and guests played golf, and the balance either played in the horseshoe tournament or cheered and heckled those who did. Seventy-two sat down to a fine chicken dinner served by Mrs. Gloss and her daughter.

Mayor Lehman of Elgin, a former sheet metal contractor, gave a short talk. John P. Scheets, Ray Lorenz, D. C. Ellison and Ted Garrity also gave splendid impromptu talks.

In memory to three departed members, Frank Davis and A. C. Juby of Elgin and William Smith of Geneva, Post President Fred Nolting offered prayer.

Music, cards and general good fellowship were enjoyed during the evening.

Prizes were awarded as follows: The traveling trophy for the horseshoe pitching championship, which had been held by Post Secretary Walter Eissler, passed on to George Bushman, our present secretary.

Prizes at golf were won as follows:

Blind Bogey open to all—Ray Lorenz  
1st low gross—guests—H. Wilhelmi  
2nd low gross—guests—Ralph Reid  
1st low net—guests—Stewart Ericson  
2nd low net—guests—D. C. Ellison  
1st low gross—members—Jack Stowell  
2nd low gross—members—Fred Nolting  
1st low net—members—Walter Jeske  
High gross—W. C. Ballou

A birthday party is planned for September when our association will be five years old.

Jack Stowell, President.

### Toledo

In a letter dated July 20 "to all members" Henry C. Bitter, Secretary, The Toledo Sheet Metal & Roofing Contractors Association, Inc., Toledo, writes:

"The last several meetings have been postponed—and—perhaps two or three more meetings will also be postponed. This does not mean that your Association has died—you may rest assured that it isn't even sick.

"The Trustees have held meetings—The Labor Board has functioned—The Secretary has been on the job—and 'everything is under control.' Of course, there are still those in our industry who are so charitably inclined that they seem to be willing to donate their merchandise, labor, equipment, experience, talent, profit and overhead to their customers—you just can't do a damn thing about that, but let them go broke. But 'all in all' there is something about it that makes a fellow stick and keep on hammering, hoping that some time a day will dawn when men will begin to scratch their heads and perhaps pull their hair and say 'what a damn fool I've been all these years. . . I've grown old, I've worn out all my equipment, I've exhausted my credit and after all these years of slaving I haven't got a pot to cook in.' Yes, when that happens life will really be worth while. Yes, when?

\* \* \*

"On last Saturday your Secretary was in Buffalo at a National Secretaries' Conference where things were done, which will really mean something to our industry. We hold 'one-day' sessions where there is no playing. The next meeting will be in Toledo on September 17th and you will all be invited.

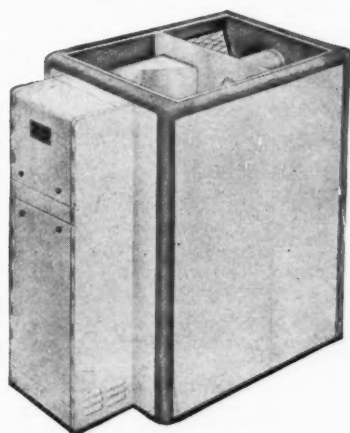
"The Mechanical Warm Air Heating Ordinance is ready for the printer. The Stoker, Oil Burner, Gas Burner Ordinance is about ready for the Law Department.

"On August 30th there will be a 'blow-out' for the Apprentices at Swiss Hall on South St. Clair Street and of course you will be invited.

"A statement for your dues is enclosed—mail your check—the 'kitty' needs some milk."



## ON TOP IN QUALITY



## ON BOTTOM IN PRICE



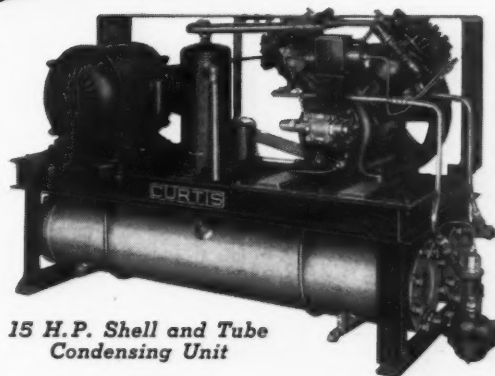
*For Franchise and Territory  
write*

**PERFECT BURNER CO.**  
**Lynn Mass.**

**Perfect Forced WARM AIR CONDITIONING**

**Why You Serve Your Best Interests  
and Those of Your Customers  
When You**

***Specify* CURTIS  
Condensing Units**



**15 H.P. Shell and Tube  
Condensing Unit**

BY RECOMMENDING CURTIS equipment you and your customers benefit by the assurance of economical, efficient, care-free performance. Check Curtis engineering details yourself, check Curtis design and construction, and you'll find reliability built into every detail.

Curtis units deliver years of trouble-free service and true operating economy under all conditions, thanks to Curtis engineering. Curtis created the exclusive patented "Centro-Ring" method of positive pressure lubrication; Curtis design includes Timken Tapered Roller Main Bearings, water-jacketed compressor heads and cylinders, drop-forged, heat-treated crankshafts and connecting rods; balanced sylphon bellows seal.

There is a Curtis model for every refrigeration and air conditioning requirement, from  $\frac{1}{6}$  to 30 h. p., air and water cooled. Counter flow, cleanable shell and tube and evaporative condenser models are available. Thousands of Curtis condensing units are in use throughout the world today.

84 years of successful manufacturing experience backs every Curtis product—including 44 years of specialization in building fine compressors. You can sell and recommend Curtis equipment in absolute confidence—for Curtis stands for *reliability* in every respect.

**CURTIS REFRIGERATING MACHINE CO.**

*Division of Curtis  
Manufacturing Company*  
1946 Kienlen Avenue  
Saint Louis, Missouri

Write today for  
the new Curtis  
folder C-68 on  
Air Condi-  
tioning

**CURTIS**  
**REFRIGERATION**  
AIR CONDITIONING  
AND COMMERCIAL



## How Can I Get More Comfortable Heat?

Many of your customers and prospects are in the market now for controls that will give them better performance of their heating plants and more satisfactory and comfortable heat.

Tell them why the Cook Furnace Switch is so important to the successful operation of their furnaces. Tell them — and you'll sell them. For Cook Switches are built to give long-life, dependable, trouble-free service. Important improvements in design and construction provide greater convenience in installation and operation and more efficient performance.

There are good profit reasons for you to write today for detailed information about Cook Warm Air Switches for Fan, Blower and Limit Control.

*New Simplicity of Installation  
New Efficiency in Operation*



### COOK CONTROLS

THERMOSTATS—FURNACE LIMIT CONTROLS  
ZONE CONTROLS—BLOWER CONTROLS

COOK ELECTRIC CO.

2678 Southport Avenue

CHICAGO

## Association Activities

### Cincinnati

The Greater Cincinnati Warm Air Heating Association was recently organized by a large group of furnace and heating contractors. The purpose of the association shall be for the promotion of the proper installation of warm air heating systems and the enactment of proper codes in the surrounding area to govern these installations.

Officers of the association are Morris Chadwick, president; G. L. Kerentoff, vice president; L. E. Stevens, secretary and Jake Jacobs, treasurer.

The membership campaign is under way and Casey Jones as chairman of the Membership Committee is putting forth his best efforts to enroll all of the warm air heating men of Greater Cincinnati. Although the association is only a few months old its membership has grown by leaps and bounds. The members feel that this association will fill a long felt need for such an organization in this field.

The meetings will be held on the first Tuesday of each month.

F. A. Gastright, Director of Publicity.

### Milwaukee

The Master Sheet Metal, Heating, Ventilating and Air Conditioning Contractors' Association of Milwaukee held their monthly meeting at Guild Hall, Republican Hotel on Monday, July 11.

President Frank Kramer called the meeting to order.

Initiation fees were voted raised from \$10 to \$25, beginning August 1, the vote being 12 to 11.

Director Schomann related his story on copper roofing.

A motion was made by Holming and seconded by Schaar that every one entering our association as a member and those now members should carry compensation insurance and it was resolved to embody a resolution into our next meeting notices that membership is only attainable if they carry compensation insurance.

The subject of apprentices again received attention.

Stickers for the National Warm Air Heating & Air Conditioning Week to be held in Chicago, August 21 to 27 were distributed to members present.

The letter of the Wisconsin Compensation Rating and Inspection Bureau, asking us to sit in at their July 19 meeting for the purpose of making a critical examination of the present method of establishing rates, was considered and discussed. A committee was appointed—members A. Mantei, Alfred C. Goethel and Oscar Hoffmann in connection with your secretary—to attend this meeting and report back at the August meeting.

Lunch, refreshments and card playing concluded the meeting.

Paul L. Biersach, Executive Secretary.

### Wisconsin

Master Sheet Metal, Heating, Ventilating and Air Conditioning Contractors Association, Inc., of Wisconsin—director's meeting, including the district meeting—was held at Shawano on Saturday, July 9.

President R. F. Gehrke opened the meeting and presented O. W. Rainlaw representing the C. of C. of Shawano, who welcomed the group in behalf of the mayor and city. All business—reading of the minutes, the financial situation, membership, warm air heating and air conditioning—was transacted; also legislation committees reported on their activities. Secretary Biersach reported the "Secretaries' Conferences" matters and was requested to attend the next Conference.

James Feschette of the Menominee Reservation showed the group through the 360,000 acre reservation, explaining their method of wood milling, lumbering, etc.

Mrs. R. F. Gehrke and her three daughters supervised a splendid lunch at "Twin Pines" cottage on Shawano Lake. Singing, fishing and motor boating completed the afternoon and in the evening all were taken to the Schalagoko Country Club for dancing.

Paul Biersach, Secretary.



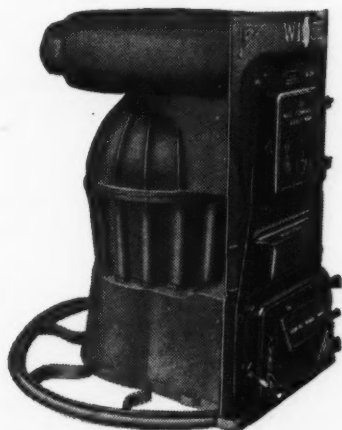
Selling

## WISE FURNACES

AIR CONDITIONERS AND  
GRAVITY UNITS

Gives more profit to the dealer and more  
satisfaction to the consumer.

EASY TO SELL  
EASY TO INSTALL  
EASY TO OPERATE  
SELF CLEANING RADIATOR  
AIR CELL GAS AND SMOKE  
CONSUMING FIRE POT  
HEAVY CONSTRUCTION  
PLEASING DESIGN



**THE WISE FURNACE COMPANY**  
AKRON, OHIO

## USE

### Randall Bearings for Extra Service

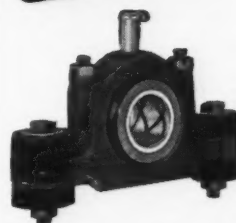
Here are some of the reasons why you get  
extra service when you use Randall Pillow  
Blocks:

- They are self-aligning
- They are self-lubricating
- They are silent in operation
- They have a low running torque
- They are made of finest materials
- Large sizes Standard, precision bored  
Small sizes Standard, ream finished

Randall Pillow Blocks are economical to  
use and require only a minimum of atten-  
tion to last a lifetime. They are trouble-free  
in the field and give assurance to any manu-  
facturer or contractor that there will be no  
bearing trouble in his unit.



Standard Pillow Block —  
For ordinary use on fur-  
nace blower or air condi-  
tioning equipment. With a  
minimum of attention the  
Standard Pillow Block will  
last a lifetime.



\*Rubber Mounted Pillow  
Block — Isolates the sup-  
porting members at the  
contact point of the frame  
or blower housing. The  
oil resisting rubber grom-  
mets absorb foreign noise  
and vibration.

\*Also supplied with large oiler.

Write for 1938 catalog describing, in detail, the  
complete line of Randall Pillow Blocks.

#### EASTERN STOCKS

Tek Bearing Co.  
177 La Fayette  
New York City

American Stock Gear Co.  
100 St. Clair Ave., N. W.  
Cleveland, Ohio

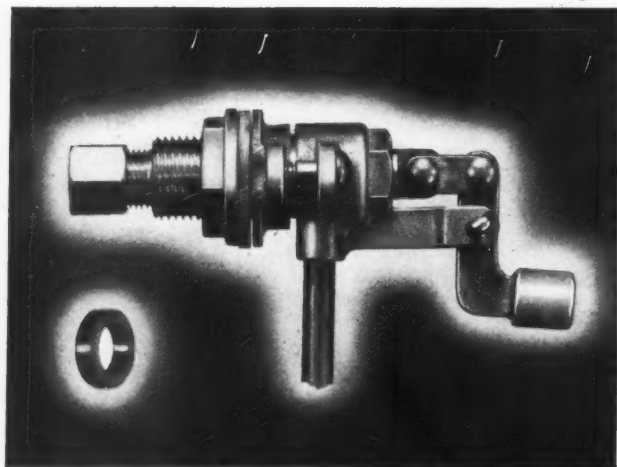
#### PACIFIC COAST STOCKS

Utility Fan Corp.  
Los Angeles, Cal.

C. W. Marwedel  
San Francisco, Cal.

**Randall GRAPHITE PRODUCTS CORP.**  
Dept. 811 609 W. Lake St., Chicago, Ill.





## Laughs at Corrosion

The tiny plastic ring washer in this M-VB Humidifier Valve is one of its best selling points. The ring, acting as the plunger bearing, resists heat and water . . . prevents water from splashing back when the valve is open . . . and so keeps corrosive foreign matter away from working parts.

Telling customers *that* — showing them how this M-VB product for a few dollars provides healthful moisture, increases furnace efficiency, and saves on fuel — is bringing in the sales.

Note the hex shape on the end of the body. This makes the valve easy to hold while the lock nut is tightened on the outside. You can install this valve in a half hour, without dropping the fire.

Your wholesaler will show you a complete M-VB Humidifier package containing everything you need for the job. Or write direct to Morency - Van Buren, Sturgis, Michigan.

*Saves You Time in Selling — Time in Installing*



# SCOVILL

MANUFACTURING COMPANY

MORENCY - VAN BUREN DIVISION  
STURGIS, MICHIGAN

Complete closet tank fittings and humidifier stocks also maintained at Waterville, Connecticut and San Francisco.

## With the Manufacturers . . .

### ARMCO Elects Officers

Charles R. Hook, president of The American Rolling Mill Company, Middletown, Ohio, announces the election of Calvin Verity as Executive Vice President and General Manager and W. W. Sebald as Vice President and Assistant General Manager of the company.

### I. W. Rowell Leaves Furblo

Announcement is made by I. W. Rowell that he has resigned his connection with Furblo Company. His successor has not yet been appointed and he has not yet decided upon future activity. Mr. Rowell says "I hope, however, that I may have the pleasure of remaining in the warm air heating field." No further details are available.

### Copper and Brass

John A. Coe of the American Brass Co., was elected president of the Copper and Brass Mill Products Association which held its annual meeting at Hot Springs, Va., recently. Other officers elected were R. E. Day, of Bridgeport Brass Co., Wylie Brown, of Phelps Dodge Copper Products Corporation, and R. L. Coe, of Chase Brass & Copper Co., vice presidents; C. D. Dallas, of Revere Copper & Brass, Inc., treasurer; and T. E. Veltfort, secretary.



New display room of the Air Conditioning Supply Co. at 4060 Superior Avenue, Cleveland. Present quarters have more than three times the space of the previous location

### "Home Comfort" Changes

The entire business and assets of the "Home Comfort" Furnace & Mfg. Co., were taken over by the "Home Comfort" Furnace Co. on July 5, according to an announcement signed by L. E. Meisinger.

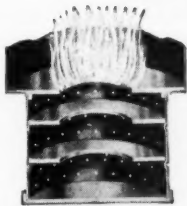
Existing selling policies will be continued. All correspondence and remittances should be addressed to the "Home Comfort" Furnace Co., 2901-11 Elliot Ave., St. Louis, Mo.

### Earnest Re-elected Anthracite President

Frank W. Earnest, Jr., was re-elected president of Anthracite Industries, Inc., at the Annual Meeting of the Board of Directors recently. Other officers re-elected were G. Gordon Cook, vice-president and treasurer; and George W. Barnes, secretary.

In a statement issued after his re-election, Mr. Earnest said: "Anthracite Industries, Inc., is an organization sponsored by leading Pennsylvania hard coal producing companies, organized two years ago to lead the industry in a united campaign for a larger share of the fuel market. The policy of newspaper advertising, research, equipment development and dealer education will be continued.

# MORE LIVE TERRITORIES OPEN TO Lochinvar DEALERS!



LISTED AS  
STANDARD BY  
UNDERWRITERS  
LABORATORIES

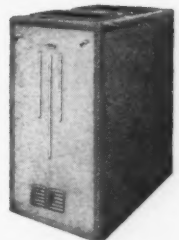
## NOW MULTIPLE-STAGE BURNER LISTED AS STANDARD FOR NO. 2 OIL

**B**ECAUSE the difference in cost between the No. 1 and No. 2 fuel oil is so great in certain sections of the country, Lochinvar has improved and developed their Multiple-Stage Burner so that you now get the advantage of quiet operation, no moving parts and service free performance from this burner that will use the lowest price domestic fuel oil with the greatest economy.

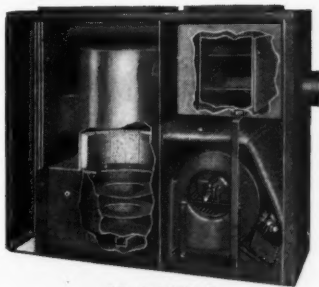
Underwriters Laboratories have listed as standard Lochinvar's Improved Multiple-Stage burner for No. 2 fuel oil thus assuring you that this burner has been thoroughly tested for faultless mechanical operation and efficient fuel operation.

### AT NO EXTRA COST

This improved Burner costs no more than the old type burner, thus keeping the prices of all Lochinvar automatic oil-burning furnaces the lowest in the field today. Illustrated are the Lochinvar furnaces that are designed for the moderate priced homes. Write today for information.



Junior-Aire



Model 100-A



Model 100

**LOCHINVAR CORPORATION**  
14247 TIREMAN AVE., DEARBORN, MICH.

## BLO-ETTE

The 1,000 c.f.m. capacity FURNACE BLOWER  
A COMPLETE BLOWER... not a fan!



Less Than **\$40**

- Shipped assembled
- Large access door
- Effective summer cooling
- Automatic cut-out on motor
- Two 15"x20" filters
- Leak-proof filter frames
- Low speed... high pressure
- Self lubricating bearings
- Automatic belt tightening device
- 1/6 H.P. long hour motor

*Blo-ette is also sold less casing, filters and motor*

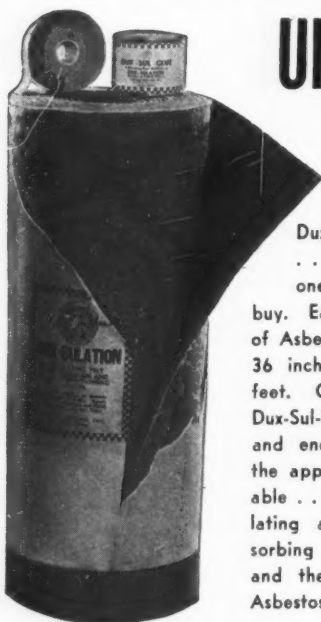
### Ready to Install

1,000 c.f.m.—large enough to remedy the many thousands of unsatisfactory gravity jobs now installed AT A LOW COST! Your inquiry will bring complete data and prices. Write now.

**The Lau Blower Company**  
Dayton, Ohio

# DUX-SULATION

## ASBESTOS PROTECTED UNIT PACKAGE

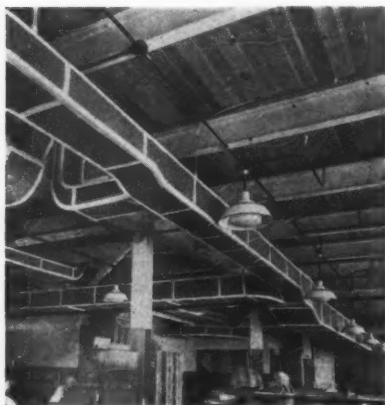


### NOTHING ELSE TO BUY

Dux-Sulation comes to you complete . . . ready for installation . . . as one unit . . . with nothing else to buy. Each package consists of one roll of Asbestos Protected Dux-Sulation Felt, 36 inches wide containing 100 square feet. One roll of Asbestos Protected Dux-Sul-Tape to finish corners and joints, and enough Dux-Sul-Glue to complete the application. It is flexible . . . durable . . . has high insulating and sound absorbing qualities . . . and the entire job is Asbestos Protected.

### SO EASY TO APPLY

Dux-Sulation is extremely simple to apply. The only things necessary to complete its perfect application are a knife and a paint brush. It is easy to handle as the complete roll can be conveniently carried to any place on the job. You don't have to fool with lugs, bolts, screws, or wire. It does not have to be soaked or scored, and no plastic cements are needed. Asbestos Protected Dux-Sulation is the most economical insulation to use, for every square inch can be used with perfect results.



### THE FINISHED JOB

Dux-Sulation makes a most attractive finished job. Its surface has a most desirable pattern which eliminates further painting. When a Dux-Sulation job is finished you have not only beautiful appearance but long life and perfect insulation.

WRITE FOR BULLETIN 386

### GRANT WILSON, INC.

4101 West Taylor Street

Chicago, Illinois

### PLANT RUBBER & ASBESTOS WORKS

537 Brannan Street

San Francisco, Cal.

### AIR CONDITIONING UTILITIES CO.

8 West 40th Street

New York, N. Y.

## With the Manufacturers . .

### Steels of Today and Tomorrow

Allegheny Steel Co. and Ludlum Steel Co., two of the country's specialists in the field of alloy steels, are co-operating with the New York Museum of Science and Industry in presenting at the Museum, Rockefeller Center, a new exhibit known as "Steels of Today and Tomorrow." The purpose of the exhibit is to show to the public the



many new and expanding uses of steel and to forecast some of the expected developments that offer splendid opportunities for stimulating recovery.

At a preview, Hiland G. Batcheller, President of Ludlum, noted that in a U. S. Department of Commerce bulletin just released, steel production since 1885 shows the extraordinary average annual growth of 7.2 per cent as compared with 4.3 per cent in manufacturing generally, and 3.7 per cent in the country's total production; while the country's population averaged an annual growth of only 1.9 per cent.

### Window Conditioning Campaign

A broad advertising and merchandising program to focus attention upon the most important single form of insulation—window conditioning by means of double glass—is being launched by the Libbey-Owens-Ford Glass Company, Toledo.

Designed primarily to educate the public to the many advantages of Window Conditioning, the campaign will be conducted in such a way as to be of direct benefit to the building industry.

Fundamentally, it will stress the most important form of insulation, double glazing of windows and doors by one method or another.

"There are 12,000,000 homes in the United States with central heating plants. This vast number of dwellings represents an immediate market for Window Conditioning," said John D. Biggers, president of Libbey-Owens-Ford, in announcing the campaign.

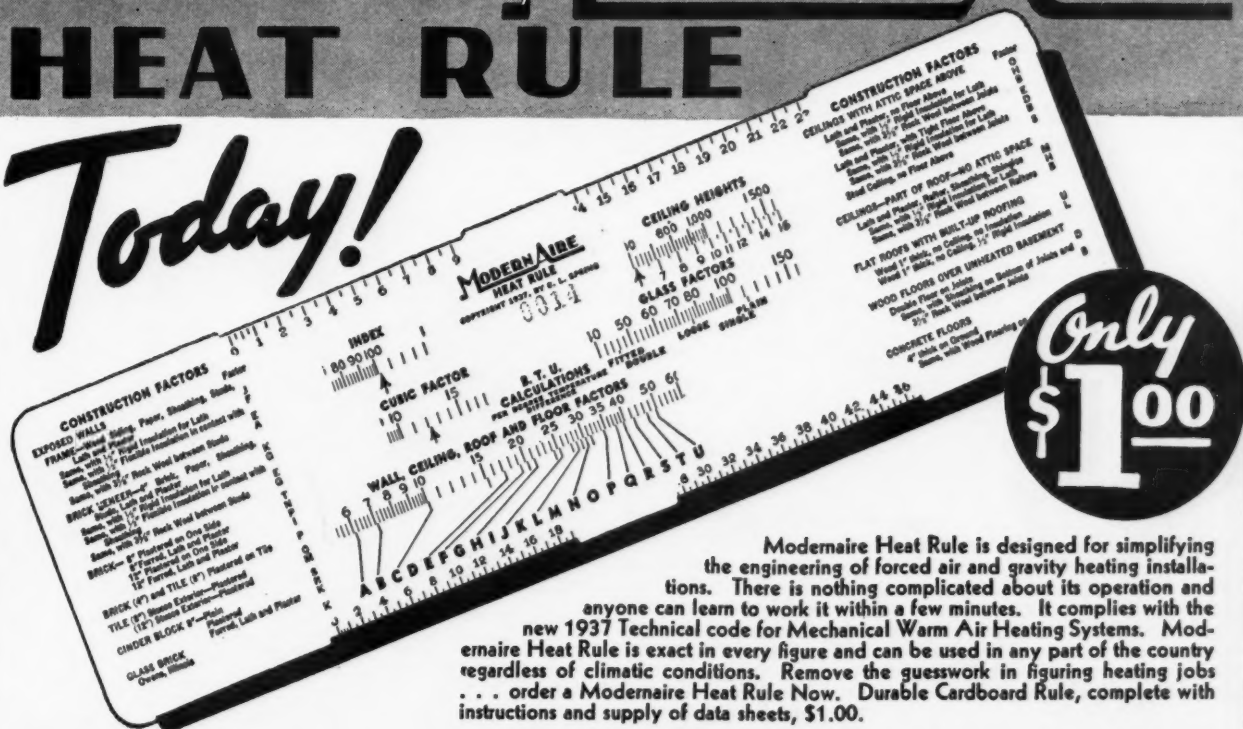
Research findings and recommendations of experts in various parts of the country will be published. These data form the basis for many powerful selling arguments which have been prepared by Libbey-Owens-Ford. In addition, the campaign will feature such important "helpful hints" as the fact that Window Conditioning can be financed under F.H.A. with no down payment.

It is significant that Libbey-Owens-Ford does not contemplate a brief campaign, but rather a program of carefully scheduled activities designed to build up interest over an extended period so as to assure increasing and permanent benefits for both the building industry generally and the consumer.



# ORDER A MODERNAIRE HEAT RULE

## Today!



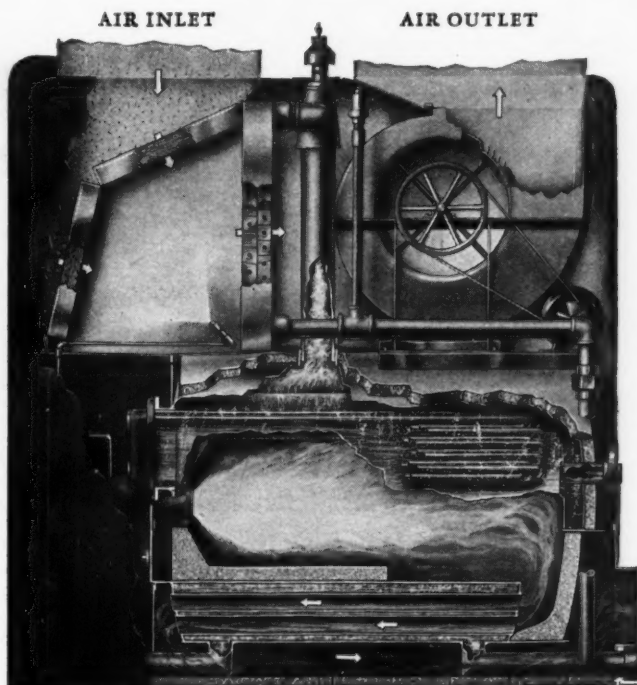
Modernaire Heat Rule is designed for simplifying the engineering of forced air and gravity heating installations. There is nothing complicated about its operation and anyone can learn to work it within a few minutes. It complies with the new 1937 Technical code for Mechanical Warm Air Heating Systems. Modernaire Heat Rule is exact in every figure and can be used in any part of the country regardless of climatic conditions. Remove the guesswork in figuring heating jobs . . . order a Modernaire Heat Rule Now. Durable Cardboard Rule, complete with instructions and supply of data sheets, \$1.00.

**MODERNAIRE ENGINEERING COMPANY**

107 S. W. 2nd Ave.  
Des Moines, Iowa

Get the "INSIDE STORY" on

# SELECTAIR



AIR FILTERS, humidifier and heat transfer units are all arranged in compact design directly above the boiler in this fine air-conditioning unit . . . Selectair offers every desired feature for economically heating, air-conditioning and ventilating the modern home . . . Domestic hot water the year 'round . . . Oil fired by the Johnson Pressure-Type Burner, Selectair is fully automatic, maintaining constant humidity and temperature in the home whatever the weather may be outside.

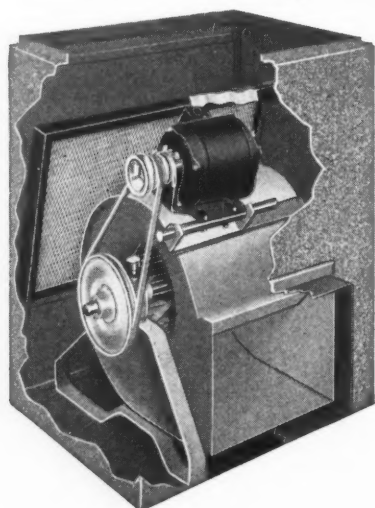
Worthwhile territories and Johnson franchises available to aggressive dealers anxious to serve their communities with a complete line. Write us today giving full details as to qualifications.



**S. T. JOHNSON CO.**

940 ARLINGTON, OAKLAND, CALIFORNIA  
401 N. BROAD ST., PHILADELPHIA, PA.

**THERE'S A JOHNSON OIL BURNER FOR EVERY PURPOSE**



**REX**  
AIR-PAK

Junior Model 100

*for the low  
Price Market!*

This new Junior Model No. 100 REX-AIR-PAK blower filter unit has proved to be a startling seller and profit maker. It possesses every superior feature desired by furnace manufacturers, dealers, contractors and architects everywhere.

A complete package unit that can be quickly and easily installed and is as easy to handle as any household appliance.

Such features as the overload protector which prevents motor burn-out; leakproof filter frames; four-speed pulley, providing capacities ranging from 650 CFM to 1,000 CFM, and a dozen other superior features all combine to make it the outstanding blower filter unit in the field.

Why not make a real profit this year? You should be able to sell far more of this new Junior model than you did of any conventional blower in 1937.

Mail the coupon now to get complete details on the model JR-100 and the complete line of REX-AIR-PAKS.

**AIR CONTROLS, INC.**  
Div. of The Cleveland Heater Co.  
1933 West 114th, Cleveland, O.

Name .....

Address .....

City ..... State .....  
A.A.-8-B

## With the Manufacturers . .

### Revere Opens Houston Office

Revere Copper and Brass, Inc., announces the opening of an office at 915 Second National Bank Building, Houston, Texas. Hans O. Howard, formerly of the Dallas office will be in charge.



Left: B. F. McLouth, Engineer, Dail Steel Products Company, on his way to the Milwaukee Convention of the National Warm Air Heating & Air Conditioning Association, holding the fish he caught and took to Milwaukee to feed the code committee. Right: Fred Bishop.

Mr. McLouth and Mr. Bishop left Lansing on Friday night, June 10, stopping at Wolverine, crossing the Straits of Mackinaw, and stopping at Indian Lake near Manistique, Saturday and Sunday, before attending the convention Monday morning. They say their biggest fish weighed approximately 5 1/4 pounds and was 29 inches long.

### Heads Loyal-Knight

L. Edward Chance has been appointed president and general manager of the "Loyal-Knight" Mfg. Corp., Belleville, Illinois, manufacturers of a line of stokers, room coolers, and furnace blowers. Other officers are: Ludwig L. Carl, secretary and assistant general manager; and Alan O. Hickcox, treasurer. Mr. Carl, a former professor of engineering at Heidelberg University in Germany, comes to the "Loyal-Knight" organization from National Stoker Company.

### Econ-O-Col Dealers Meet

The Econ-O-Col Stoker Division of Cotta Transmission Corp., Central Illinois dealers met on June 15 and 16, in the Rockford plant, to hear plans outlined for a fall sales offensive.



Speakers included A. D. Scoville, general manager, on discounts and finance plans; H. B. Scoville, sales manager, on markets, prospects, and sales features; Floyd Nelson, plant superintendent, on mechanical developments, servicing problems, and adjustments; N. R. Nelson, Rockford distributor, on Rockford sales methods; and George L. Koehn, of Howard H. Monk and Associates, on the sales promotion campaign for 1938-39.

# HESS EQUIPMENT

## FILLS EVERY DEALER REQUIREMENT

### ◆ DISTINCTIVELY DIFFERENT ◆



The Benefactor Welded Steel Furnace is combined with the Hess Blower Filter Unit as one complete furnace, or the furnace or blower unit can be purchased separately.

#### BENEFACITOR WELDED STEEL FURNACE

Competes in price with ordinary cast iron furnaces, but excels ordinary steel furnaces in every way. Why sell ordinary type furnaces as sold by mail order houses when the Hess Benefactor furnace offers you far greater opportunity for profits?

#### HESS BLOWER FILTER UNIT

is completely factory assembled, capacities up to 2,500 c.f.m., large hinged doors, motor high off floor, no expensive transition fittings required. Extremely quiet and many other features.

WRITE TODAY FOR DEALER PORTFOLIO OF ENTIRE HESS LINE  
UNUSUAL EXCLUSIVE TERRITORY SELLING PLAN GIVES GREAT ADVANTAGES

**HESS WARMING & VENTILATING CO.**

FOUNDED 1873

1211 S. WESTERN AVE.

CHICAGO, ILL.

# YES!

## CONCO STILL HAS A FEW TERRITORIES OPEN!

**BETTER HURRY BEFORE YOUR TERRITORY IS GONE**  
... GET ORGANIZED BEFORE THE BIG FALL SELLING SEASON



**CONCO-SAMPSEL STOKER CORPORATION, MENDOTA, ILLINOIS**

DIVISION OF H. D. CONKEY & COMPANY . BOX 111A





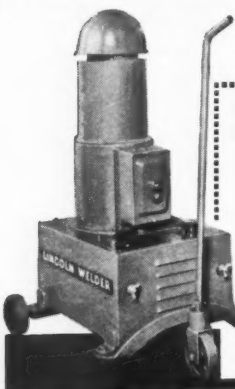
★ A Lincoln Sheet Metal Shop Welder normally uses less than 10¢ worth of power per hour.

Because of this economy, one shop, changing from the other welding process, reports a saving of \$86 per month. "Also," the manager says, "we are able to weld twice as fast and can apply welding to more of our work resulting in lower costs and greater volume. The welder paid for itself inside of two months and since then has been accumulating profits."

Since this Lincoln Welder is of d. c. motor generator type, it enables you to weld all kinds of work including galvanized stainless steel, cast iron, aluminum, copper and alloys. It is always just as handy and ready for action as a portable drill or any other electric tool.

Consult the nearest Lincoln office or mail the coupon for complete details and new low prices.

## THE LINCOLN ELECTRIC COMPANY



*Largest Manufacturers of Arc  
Welding Equipment in the World*

**THE LINCOLN ELECTRIC CO.**  
Dept. EE-519, Cleveland, Ohio

Send free copy of Bul. 313 and payment details  
on the Lincoln Sheet Metal Shop Welder.

Name  Position

Company

Address

City  State

## News Items . . . . .

### Coast Air Conditioning Show

Thousands of Southern Californians are more interested in and familiar with air conditioning, following the first public air conditioning show ever held in the West. For four days, from July 7 to 10, the Thermo Air Conditioning Institute Building in Los Angeles was crowded with prospective equipment buyers who were attending the First Los Angeles Air Conditioning, Cooling and Heating Show. Some of the visitors came from as far as Texas, and many from the adjoining states of Arizona, Utah and New Mexico.

Planned originally as a trade show for contractors and commercial users, the exhibit was expanded to develop general public interest. Fifty-three displays, requiring more than 10,000 square feet of space, showed a complete range of equipment for air conditioning, cooling and heating.

Cooperating organizations were the Air Conditioning and Refrigeration Association of Southern California, the Southern California Chapter of the American Society of Heating and Ventilating Engineers, the Electrical Development League, Los Angeles Bureau of Power and Light, Los Angeles Chamber of Commerce, Southern California Edison Company, and Thermo Air Conditioning Institute.

The committee in charge was headed by Howard H. Douglas of the Southern California Edison Company, and included Ben B. Breslow, Utility Fan Corp., W. E. Cranstons, Jr., Thermador Mfg. Co.; Ivan de Jongh, de Jongh-Howells Corp.; E. C. Flynn, Payne Furnace & Supply Co., Inc.; H. F. Haldeman; George Hartman, Hartman Engineering Co.; F. L. Hockensmith, Electrical Development League; Wm. W. Sanford, Thermo Air Conditioning Institute; Earl S. Anderson; Edward H. Kendall, English & Lauer, Inc.; Wm. W. Pearce, L. A. Bureau of Power & Light; Dr. Frederick Pernot, Pernot & Rich, Inc.; W. A. Pruitt, Air Conditioning & Refrigeration Assn.; Emmett Quinn, Pacific Fruit Express; and A. B. Wicks, Department of Building and Safety.

The Thermo Air Conditioning Institute, in whose building this show was held, is a nationwide training institution for air conditioning and combustion engineers. Their laboratories and schools are located in New York and Chicago, in addition to Los Angeles.

### Sales Tax in Canada

The Canadian sheet metal industry is seeking further amendments to the recent sales tax regulations on 40 building material items which, while attempting to remove the eight per cent sales tax in order to encourage a revival of construction in the Dominion, in effect merely shifts the tax from the finished goods to the raw material. Efforts toward these changes were endorsed at a meeting of manufacturers using sheet metal, held at Toronto on June 21.

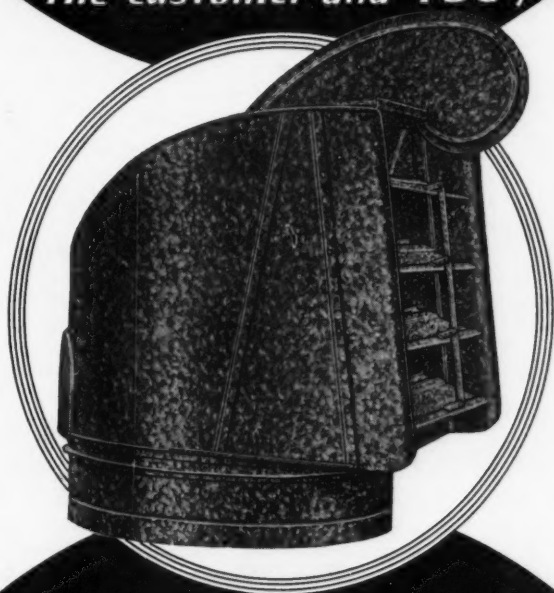
The manufacturers pointed out that sheet metal roofing and siding, which is used extensively in buildings especially on the farm, would not receive any benefit from the new sales tax regulations because the tax must still be paid on the raw goods. This is then passed on by the manufacturer to the consumer.

"Sheet metal building materials are completely made in Canada from ore to finished product and thus are entitled to consideration from the government equal in every respect to the advantages given other building products," S. F. Frame, secretary of the Sheet Metal Council, said at the meeting.

"At present, the tax changes are in the nature of a discrimination against these manufacturers, which in turn, is discrimination against farm buildings because these products are extremely important for reasons of long-term economy, fire protection and protection against lightning."

These tax changes, which removed the sales tax from every major manufactured building material item, were promulgated in the budget message sent to the Dominion House of Commons by Finance Minister Charles A. Dunning on June 16.

**When Ventilation  
Conditions are Tough-  
Requirements Exacting-  
and Customers Particular-  
Here's the answer for both  
the customer and YOU!**



*The NEW*  
**Swartwout  
ROTARY  
BALL BEARING  
VENTILATOR**

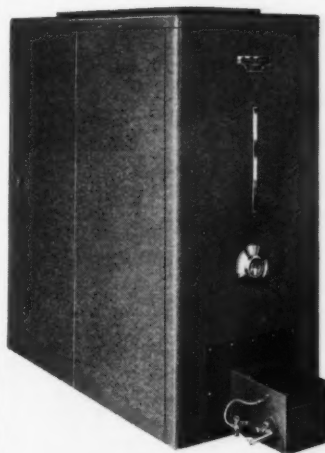
- Newly improved design and construction —  
greater capacity — more dependable than ever  
— pleasing, modern appearance — backed by  
a 27 year record of outstanding successful  
performance.

Attractive discount to Sheet Metal Contractors  
— write for prices and full information.

**THE SWARTWOUT COMPANY**  
18615 EUCLID AVENUE, CLEVELAND, OHIO

# COMFORTZONE G-90

**THE Gas JOB THAT IS  
DESIGNED FOR THE MODERATE  
PRICED HOME!**

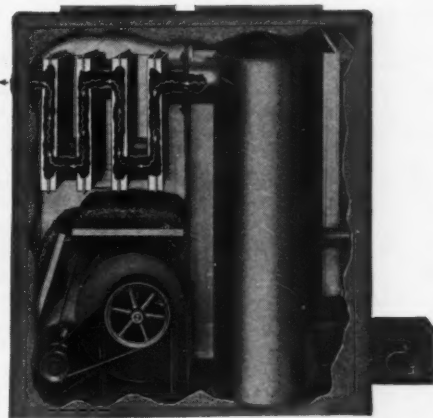


The Comfortzone G-90 is truly modern in every detail, because it has incorporated in its construction the best engineered principles of heating efficiency. It is an entirely automatic gas fired winter air-conditioning furnace that circulates the proper heated, filtered and humidified air throughout the home, making it possible to heat all the rooms at a constant temperature. You light this furnace in the fall and forget it until spring, because there isn't a fuel tank gauge to watch, no dirt or dust to contend with, and its quiet and trouble-free operation will please the most exacting buyer. It has an attractive ripple green finish and chrome trim.

## HAS MOST EFFICIENT OPERATION

The down-draft principle of heating employed in this furnace has proved to be the most efficient. When the return air enters the furnace it passes through the radiator where it is preheated, then through the filters to the blower, and thence to the combustion chamber. As the air advances it keeps contacting a progressively hotter portion of the furnace. This method insures the utmost in heat conversion, and means a great deal in fuel economy.

Dealers: The Comfortzone G-90 is the answer to the moderate home owner who wants a gas fired job that is priced right. Territories available to representatives throughout the country.



**MICHIGAN TANK & FURNACE CORP.**  
14101 Prairie Ave. Detroit, Mich.

Gentlemen:

Please send complete information and prices on the Comfortzone line of furnaces.

Name \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

COMFORTZONE



# FREE!

## WRITE TODAY

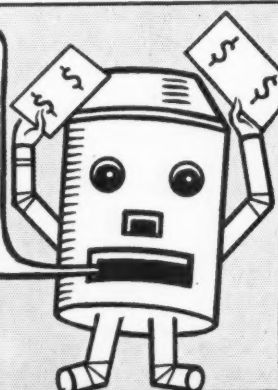
A complete line of the famous "NO STREAK" registers for gravity and forced air installations is shown in the new Rock Island Register catalog.

Many charts and tables as well as prices and estimating data are also included, making this catalog indispensable to the successful heating or air conditioning contractor. Write us today for your copy. We'll shoot it to you at once.

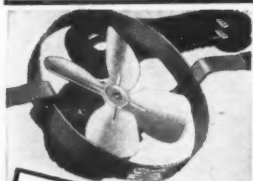


**ROCK ISLAND REGISTER CO.**  
ROCK ISLAND ILLINOIS

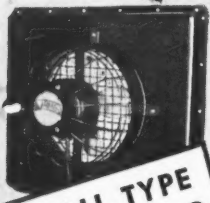
**Easy Profits**  
Making  
**COLD ROOMS**  
Warm and Cozy!



**VICTOR**  
**HEAT BOOSTERS**



FLOOR TYPE  
LIST PRICE \$7.50



WALL TYPE  
LIST PRICE \$10.00

It takes less than three minutes to cure any cold room with a Victor Heat Booster. The powerful fan first pulls out the cold air "cork" and then brings up the heat in a hurry. Overcomes sluggishness of long horizontal runs or undersized ducts. Counteracts abnormal drafts or lack of proper insulation or weatherstripping. Help yourself to extra profits by pushing Victor Heat Boosters—a demonstration will sell four out of five home owners. Write for complete details today!

**VICTOR ELECTRIC PRODUCTS, INC.**  
836 Reading Road Cincinnati, Ohio

## News Items . . . . .

### New Incorporations

The Hickey Air Conditioning System, Inc., has been organized at Spokane, Washington, by Herbert L. Hickey, H. B. De Long and G. W. Sommer to engage in the manufacture and repair of air conditioning plants.

The Majestic Radiator Enclosure Co., 26 Irving Court, Malden, Boston, Mass., is manufacturing a line of radiator shields, and is making other metal products on a contract basis.

A certificate to conduct business under the firm name of University Heating and Sheet Metal Works, at 3833 University avenue, San Diego, Cal., has been issued to the owners, George M. Sexauer and M. C. Sexauer.

The Woodland Plumbing, Heating and Sheet Metal Works has been established in Woodland, Wash., under management of A. E. Grolbert.

The Kennicott Products Co. has engaged in the heating equipment business at 4905 Santa Fe avenue, Los Angeles, Cal., under the management of Charles W. Kennicott.

A certificate to conduct business under the firm name of Day Sheet Metal Works, at 16061 Sherman Way, Van Nuys, Calif., in suburban Los Angeles, has been issued to the owners: Ernest L. Day, of the same address, and Harry L. Day, of 15555½ Roscoe boulevard, San Fernando, Calif.

The Atlas Heating Corporation has been chartered with a capital of \$10,000, and has succeeded the Atlas Heating & Service Co., 7720 Fenkell avenue, Detroit, Mich.

The Christen Air Conditioning, Inc., has been chartered at 507 N. E. 1st St., Miami, Fla., by W. L. Schuyler and others.

The Southwestern Air Conditioning Co. has been chartered in Kansas City, Mo., by G. A. Peterson, 1142 East 76th street, and Albert E. Jakebe.

Leo Rule has engaged in business at 1749 Garfield avenue, South Pasadena, Cal., under the style of Southern California Air Conditioning Co.

Robert H. Evans, formerly secretary-treasurer of the Tri-State Association of Sheet Metal Contractors in Charleston, S. C., has organized his own sheet metal firm at Jacksonville, Florida.

The Scott-Marquardt Company, Inc., at 1199 Broadway, Buffalo, N. Y., opened for business in May, 1938 with a complete stock of wholesale roofing and sheet metal supplies, including asbestos and asphalt roofing products, galvanized gutter and conductor pipe and all accessories. They are also jobbers and distributors of galvanized steel sheets, nails, stainless steel and copper sheets, furnaces and complete heating equipment. Jack Scott is president and Henry C. Marquardt vice president and treasurer. They offer complete service to the roofing and sheet metal trade and are exclusive distributors of the Mica-Monarch Asphalt Shingle.

### New Location

Airconditioning & Heating Sales Co., Not Inc., Chicago, has moved from 111 West Monroe Street to 2526 W. Madison Street, where they will put in a window and floor display and have facilities for manufacturing duct work. K. B. Fiske is in charge.

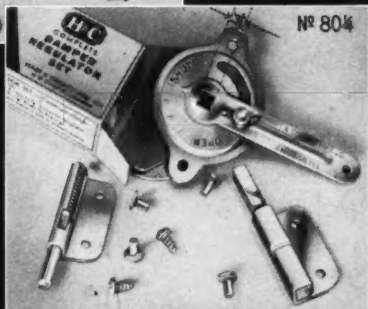


**H&C DAMPER REGULATOR SETS****BRACKET TYPE**

With  $\frac{1}{4}$ " Bearings  
as shown No. 50 $\frac{1}{4}$ .  
 $\frac{3}{8}$ " size No. 50 $\frac{3}{8}$ .

**DISK TYPE**

With  $\frac{1}{4}$ " Bearings  
as shown No. 80 $\frac{1}{4}$ .  
 $\frac{3}{8}$ " size No. 80 $\frac{3}{8}$ .



$\frac{1}{4}$ " sets have snap end bearings for easy installation of small dampers. All sets may be used with either splitter or regular dampers. All parts have rust-proof finish. Insure satisfactory installations by using H & C Damper Regulator Sets. All leading jobbers carry them.

HART & COOLEY MFG. CO., 61 W. KINZIE ST., CHICAGO, ILL.

# SERIES 300 FURBLO...



THE Series 300 Furblo adds to its other outstanding features **SECTIONAL CONSTRUCTION**, which permits easier installation, and allows access doors to be placed on any side. Quiet operation, high motor mounting and modern design also aid in making the Series 300 the blower "buy" of the year. Write NOW for literature.

Write NOW for further information.

FURBLO CO., Hermansville, Mich.

# SELL Pacific

AND PACIFIC QUALITY WILL  
KEEP YOUR CUSTOMERS SOLD

Write for details of the liberal Pacific Dealer Plan and illustrated descriptive literature showing the complete line of up-to-the-minute Pacific Gas Heating Appliances.

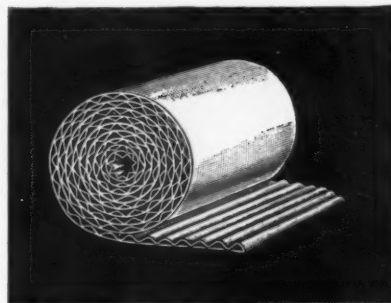
## Pacific GAS RADIATOR CO.

1740 W. Washington Blvd., Los Angeles, Calif.

Manufacturers of the Most Complete Line  
of Gas Heating Appliances in the West

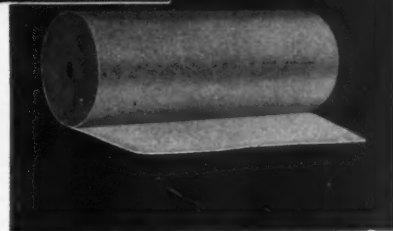
## SAL-MO Asbestos Insulation Curbs HEAT LOSS in Warm Air Furnace Installations

... Assures  
More Efficient  
Operation.



(Left) SAL-MO Asbestos Aircell Paper

**B**E sure that your Warm Air Furnace installations do not have that 30% heat loss that is usual with uninsulated pipes. When you use SAL-MO Asbestos Papers and Millboards you are sure of a perfect job and perfect insulation. SAL-MO Asbestos Products are of uniform high quality, manufactured from the best grade of Canadian asbestos fibre. Other SAL-MO Products include Pipe Joint Tape, Furnace Cement, Fireboard and coverings for all types of High and Low Pressure Pipe Lines.



**SAL-MO Asbestos Paper and Rollboard**

**SALL MOUNTAIN COMPANY**  
176 West Adams St. CHICAGO, ILL.



## "HAVE CLARAGE MAKE THEM"

Every year we ship to furnace manufacturers and to builders of unit air conditioners thousands upon thousands of Clarage Blower Wheels and Assemblies. These smaller units were designed with the same skill characteristic of the larger Clarage equipment — just as carefully constructed — just as carefully tested. And we have sizes to meet ALL REQUIREMENTS — with slow speed operation insuring SILENT PERFORMANCE. May we have your next inquiry?



CLARAGE FAN COMPANY • Kalamazoo, Mich.  
SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES



COMPLETE  
ASSEMBLIES

### SPECIFY CLARAGE

for  
COMPLETE  
AIR CONDITIONING  
VENTILATION  
HEATING  
COOLING  
MECHANICAL DRAFT  
FANS & BLOWERS FOR  
INDUSTRIAL NEEDS

## USED and APPROVED

BY THE  
COUNTRY'S  
LEADING  
MANUFACTURERS



SPECIFY  
**THARCO**  
PLASTIC CEMENTS

"For Every Heating Plant Purpose"

Outstanding Products for More Than 25 Years

MANUFACTURED ONLY BY  
**THE ARMSTRONG COMPANY**  
DETROIT DALLAS CHICAGO

### ASBESTOS FURNACE CEMENT

A plastic, easy working cement that adheres to both sides in a joint. Will not shrink; is odorless, fire and acid proof. Indestructible.

### ASBESTINE STOVE-BOILER PUTTY

A compound of asbestos fibre, pigments and selected oils. It forms a permanent joint packing in stoves, ranges, heaters. Easy to apply.

## New Literature

For your convenience in obtaining copies of new Literature, use the coupon on page 102.

### 253—Automatic Oil Burner

Par Appliance, Inc., LaCrosse, Wis., is distributing a four-page folder and a score card with testimonials regarding the Par automatic oil burner, which they say will burn as low as three-quarters of a gallon of oil per hour.

### 254—Troubles—Effect—Remedy

A. G. Brauer Supply Co., 316 N. Third St., St. Louis, is distributing an 11 x 17 in. sheet listing 44 troubles with their effect and the remedy, accompanied by diagrams, numbered to illustrate the trouble.

### 255—Foot Operated Squaring Shears

Niagara Machine & Tool Works, 637 Northland Avenue, Buffalo, N. Y., is offering Bulletin 80-B, illustrating and describing the new modern design of Niagara foot-operated squaring shears, as well as the complete line of hand-operated rotary shears, adaptable for use in the shop or out on the job.

### 256—FHA Plan

Commercial Credit Company, 1226 N. Charles St., Baltimore, Maryland, is distributing a 4-page folder entitled "Good News for the Home Heating and Air Conditioning Dealer." This company offers financing at FHA rates, no down payment, with the advantages of cash on completion of job, no liability, credit or collection responsibility.

### 257—Dux-Sulation—Data Sheets

Grant Wilson, Inc., 4101 West Taylor St., Chicago, is distributing Bulletin No. 386—8 pages—containing Dux-Sulation data sheets, covering application, thermal insulation, condensation, outside surface temperature chart, dew point temperature chart, sound absorption, frictional resistance, appearance, the package and construction.

### 258—Copper and Copper Alloys

Revere Copper and Brass Incorporated, 230 Park Avenue, New York City, is distributing the reprint of an address on "Copper and Copper Alloys" given before the Baltimore Purchasing Agents' Association by M. G. Steel, Technical Advisor for the Baltimore Division. The reprint contains helpful and accurate information on copper and copper alloys. A chart bound in the center of the booklet lists the name of the copper or alloy, its composition, tensile strength, elongation, elastic limit, wrought forms, properties and uses and methods of working.

### 259—Homes That Say Come In

The Bryant Heater Company, 17825 St. Clair Ave., Cleveland, has just released a new 16-page, 8½ x 11 book entitled "Homes That Say Come In." It is a presentation of the acceptance of gas heat for small homes by the builders who are constructing homes for the families of moderate incomes.

On various pages are shown homes in various sections of the country with Bryant "Personalized Heating," that are sold at prices from \$3500 to \$6500 on FHA terms. Some of the outstanding "low-cost" housing projects in the country are among these homes.

### 260—Lam-O-Graph and Installation Manual

Lamneck Products, Inc., 416 Dublin Ave., Columbus, Ohio, has recently published two books.

Lam-O-Graph is announced as a "graphic short cut method of estimating approximate dealer costs on Lamneck Prefabricated Duct and Fittings." Lam-O-Graph is a set of simple charts whereby a reasonably accurate preliminary price may be secured without tedious calculation or loss of time.

The Installation Manual—Series 600—explains how to assemble and install Lamneck Prefabricated Duct in residence air distribution systems.



# FAN LOUVRES

Once installed on any ventilating job, AMERICAN fan louvres perform steadily year after year with little or no attention. These louvres are strongly constructed with a heavy welded steel frame, drilled for mounting on wall or

duct. Aluminum louvres work in unison, opening from fan pressure, and closing automatically when fan stops.

Louvres can be made of stainless steel, copper or brass to meet any special order. Mounting brackets and motors for electrical operation can also be supplied if desired.

The AMERICAN line is complete. It includes Warm Air and Ventilating Grilles, Multiple Louvre Dampers and Screens, Mixing Dampers, Fused Link Fire Dampers and Screens and Single Leaf Valve and By-pass Dampers. Write us today for further information.

## THE AMERICAN WARMING AND VENTILATING CO.

1017 Summit Street  
Toledo, Ohio

663 Broadway  
New York City

# Peerless BLOWERS AND MOTORS

USED BY MANY LEADING MANUFACTURERS OF FURNACES IN MODERN AIR-CONDITIONING HEATING UNITS

A Complete Line

Package Units  
Blowers  
Wheels  
Blower Parts  
Motors  
Exhaust Fans  
Attic Fans

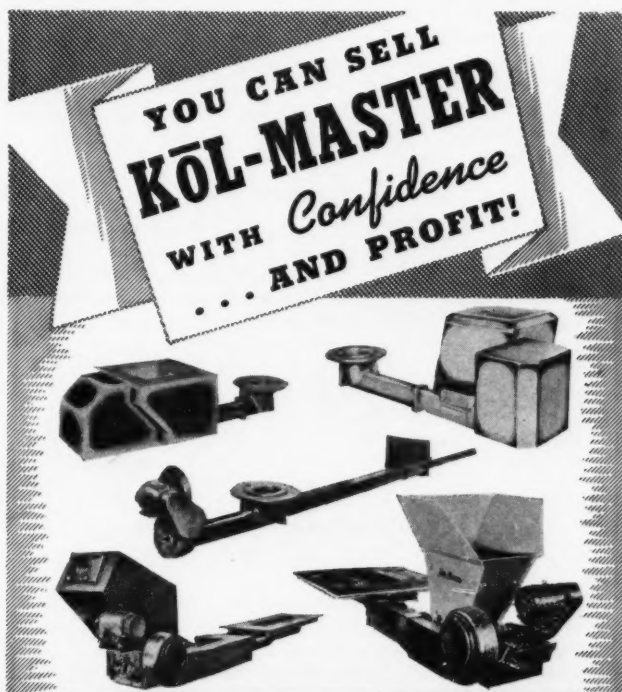


WRITE FOR CATALOG TODAY!



Since 1893 — Only the Best

THE PEERLESS ELECTRIC CO.  
WARREN, OHIO



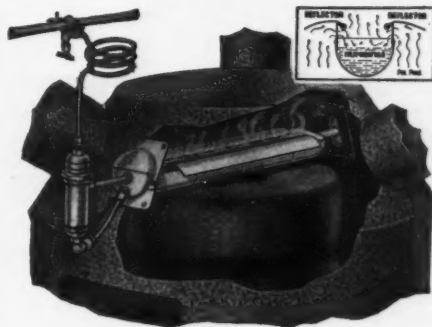
YOU CAN SELL  
**KOL-MASTER**  
WITH Confidence  
... AND PROFIT!

★ KOL-MASTER OFFERS YOU THE LARGEST, MOST COMPLETE LINE OF SINGLE RETORT, UNDERFEED, SCREWFEED STOKERS IN THE INDUSTRY . . . more than 40 models ranging in capacity from 30 to 1600 lbs. per hour!

Write for Catalog 300

KOL-MASTER CORP., OREGON, ILLINOIS

## Sell the Job ... Complete ... with Automatic Humidifiers



The No. 9  
**Zephyr**  
Automatic  
Humidifier  
for  
WARM AIR  
Furnaces

Manufacturers and installation men throughout the country realize more than ever before the selling advantage of offering a complete job. A complete and good job. That is why they are standardizing on the Maid-O-Mist line of Humidifiers. 14 types to choose from and a price range well below their worth. All types designed to obtain maximum efficiency. Built of naval bronze. Corrosion resisting. No fins to corrode. Also 8 types of Control Valves to choose from for cooling and humidifying installations.

Send for FREE CIRCULAR A-8  
and complete specifications and prices.

**MAID-O'-MIST, Inc.**

180 N. Wacker Drive,

Chicago, Ill.



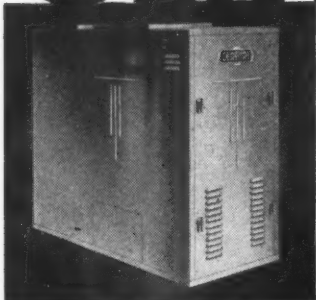
# CENTURY

## ZEPH-O-LATOR

### 85%

**OVERALL EFFICIENCY**

CENTURY ENGINEERING CORP.  
CEDAR RAPIDS IOWA



## PORTABLE SHEARS

### ALL-ALLOY



ALL-ALLOY No. 2 cuts up to 1/4" steel plate.  
ALL-ALLOY No. 1 cuts up to No. 11 gauge strip or sheet.  
Special blades may be had for shearing stainless steel.

**FULLY GUARANTEED**

**BREMIL MFG. CO. Erie, Pa.**

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### GUARANTEED TO FIT



OUR PERFECT FITTING  
PARTS INCREASE YOUR  
PROFIT ON EACH JOB

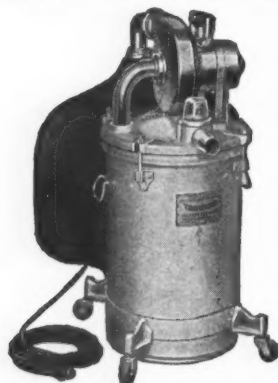
**A. G. BRAUER SUPPLY CO.**

316 North Third St. • St. Louis, Mo.

## How to Sell Furnaces and Repairs

WITH

### The TORNADO Furnace Cleaner



The TORNADO gets you into the basement where it is easy to sell repairs and new furnaces. And you make a profit on the cleaning job too!

Dealers say that the TORNADO is the most powerful furnace cleaner built. Leads the field! Low price—easy payments—free trial. Approved by Anthracite Institute and Underwriters Lab. Thousands in use.

Write now for complete information.

**Breuer Electric Mfg. Co.**  
5082 Ravenswood Avenue, Chicago, Ill.

## New Literature

For your convenience in obtaining copies of new Literature, use the coupon on page 102.

### 261—Beth-Cu-Loy for Rust-Resistance

Bethlehem Steel Company, Incorporated, Bethlehem, Pa., is distributing a new folder on Beth-Cu-Loy sheets for use wherever rust is a factor.

### 262—Milcor Products and Personnel

Milcor Steel Company, Milwaukee, Wisconsin, presents in 28 pages, spirally bound, their products—sheet metal building products and fireproof building materials—and the personnel of the organization.

### 263—Termite Protection

Copper & Brass Research Association, 420 Lexington Avenue, New York City, is offering copies of a handbook entitled "Termite Protection with Copper Shields," intended for architects, engineers, builders and sheet metal contractors—on the application of sheet copper for termite protection.

### 264—Steel Ceilings and Walls

Berger Manufacturing Division, Republic Steel Corp., Canton, Ohio, is distributing Catalog No. 7 entitled "Steel Ceilings and Walls." Besides the pages of designs, there are installation pictures and a page each devoted to the taking of measurements and how to apply, basis of prices and construction features.

### 265—Summer Comfort

The Lau Blower Co., Inc., Dayton, Ohio, is distributing in loose-leaf binder literature covering their air conditioning equipment entitled "Summer Comfort with the Lau Niteair Attic Fan." Eighteen mimeographed pages are devoted to and explanation of night air cooling and methods of installation. Another page calls attention to the demonstrator model offered.

### 266—Ash Removal Methods

Anthracite Industries, Inc., New York City, announces the publication of an eight-page bulletin, titled "Gravity Ash-Removal Methods," which presents a number of tested methods for convenient collection of ashes from heaters, furnaces, water heaters, cooking ranges and fireplaces. The bulletin, prepared by the Anthracite Fellowship of the Mellon Institute of Industrial Research, Pittsburgh, Pa., describes a number of pit and container arrangements underneath Anthracite burning heaters, the ash falling by gravity and collecting for periods up to one year without attention.

### 267—Stoker Rating Formula

A standard stoker rating formula has been prepared by the Engineering Committee and officially adopted by the members of the Stoker Manufacturers' Association. This formula, simple in design and axiomatic in application, is established as the standard method in determining the size of stokers for heating boilers and furnaces from sizes installed in small residential heating boilers and furnaces up to stokers with a burning rate of 1,200 pounds of Bituminous coal per hour. Industrial machines above 1,200 pounds of coal burned per hour are not covered in these specifications.

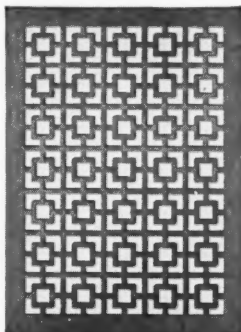
"S. M. A. Uniform Stoker Rating" booklet just released contains considerable interpretative data in the form of definitions, charts and a complete table covering all sizes of stokers up to 1,200 pounds of coal per hour capacity along with detailed explanations on how to use the charts and table.

## PERFORATED METALS

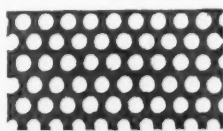
Many designs of Perforated Metal for Architectural Grilles, Radiator Enclosures, Air Conditioners, Cabinets, Safety Guards, and for all screening and sizing operations.

Steel, Stainless Steel, Brass, Bronze, Copper, Monel, Aluminum, Zinc and other metals or materials perforated to your order.

Round holes from .020" to 7". Slot holes from .008" to 3" wide. Square holes of standard sizes. Complete line of brass and tin in small sizes. Prompt Service—Pleasing Prices.



Send us your next specifications.



(Note: Equally spaced holes make for uniform strength, improved appearance and durability.)

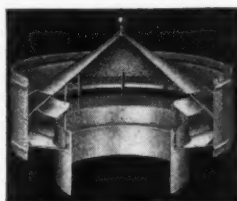
**The Harrington & King**  
PERFORATING CO.

5649 Fillmore St., Chicago, Ill.

New York Office, 114 Liberty St.

## BURT STANDARD GRAVITY VENTILATORS

Give You More  
For Your Dollar



• When you sell the complete Burt line, you not only can offer the most advanced design and construction, but you can definitely show bigger values. The new "Standard Gravity" type here illustrated gives high efficiency at low cost. It has many fine features that make good selling points. Don't hesitate to ask Burt Engineers to help you figure. Write for catalogs.

**THE BURT MFG. CO.**

Roof Ventilators

• Oil Filters

Exhaust Heads

301 MAIN STREET

AKRON, OHIO

## How the CHAMBERLIN Automatic Humidifier

Gives You... *Dependable Service*  
*Added Profits*  
*Satisfied Customers*



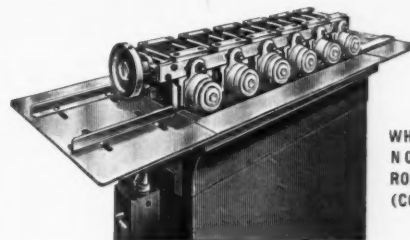
**YOU** will get added profits by selling healthful, comfortable humidification at low cost to hundreds of home owners in your community. The Chamberlin is easy to install, fully automatic and fits any furnace hood.

The large water way through the patented integrally cast trap assures free flow without liming. A long float rod on the improved valve, which is entirely above the water line, gives positive water shut-off at any pressure. Cast entirely in one piece and finished in durable baked enamel. Vapor pan is 3" deep but carries only 1" of water to insure rapid evaporation.

Manufactured by a pioneer in this field, the Chamberlin combines dependability and attractive prices to make it a real business-getter for you. Thousands now in use. Write today for prices and free circular.

Manufactured by  
**CHANDLER COMPANY**  
Cedar Rapids, Iowa

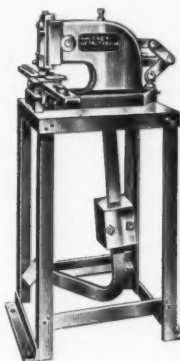
## BENDING BRACKES WHITNEY-JENSEN METAL TOOLS



WHITNEY - JENSEN  
NO. 75 DUPLEX  
ROLLING MACHINE  
(COVER REMOVED)

## SAVE MONEY ON DRIVE CLEATS

*Are You Interested in Reducing Labor  
Cost of Making Drive Cleats by 89%?*



• Use the standard Whitney-Jensen Foot Press (shown at left) equipped with special notching punch and die (and with new large steel work table, if desired) to cut notches in blanks at desired-length intervals. Fold in the sides on a Whitney-Jensen No. 75 Duplex Rolling Machine equipped with drive cleat rolls (and Pittsburgh Lock rolls on the other side). Stock blanks in strips, snip them off on the job—only one thickness to cut, all cleats straight and uniform ends open, lip formed on one end.

Write for particulars.

WHITNEY METAL TOOL CO. • 91 Forbes Street, Rockford, Illinois

## Sioux City Code

(Continued from page 67)

tion and Maintenance of Electric Wires, Apparatus and Plants within the City of Sioux City."

Section 6. Setting Heights and Combustion Space. The distance from retort to crown sheet and the space for combustion, within any heating boiler or furnace, shall be such as to secure efficient smokeless combustion and shall be in accordance with standard engineering practice and subject to the approval of the Inspector of Buildings. No stoker shall be set that burns more than four pounds of coal per hour per cubic foot of combustion space.

Section 7. Used Stokers, Reconditioned. It shall be hereafter unlawful for any person, firm or corporation to install, alter or repair stoker installations within the City of Sioux City, to install any used stoker, or for the Inspector of Buildings to issue any permit authorizing him or them so to do, until said license shall have been first submitted, with his application for such permit, an order stating that said stoker has been properly reconditioned and will comply in every way with ordinance requirements for new equipment, as to operation and adjustments.

Section 8. Alterations to Combustion Chamber. Where stokers are installed in down-draft boilers, the upper grates may be removed and baffling changed where necessary to secure an unrestricted combustion space.

Section 9. Should any sections, clause or provisions of this ordinance be held unconstitutional or invalid by any court, all other sections, clauses and provisions shall nevertheless be deemed as effective as though such unconstitutional or invalid section, clause or provision had never been inserted in this ordinance.

Section 10. Violations. The continued violation of any provision of this ordinance shall be and constitute a separate of-

fense, under this ordinance, for each and every day such violation shall continue.

Section 11. Penalties. Any person, firm, or corporation guilty of violation or causing to be violated any of the provisions of this ordinance shall upon conviction thereof, be fined in any sum not to exceed One Hundred Dollars (\$100.00) or to be imprisoned in the city jail not to exceed thirty (30) days.

Section 12. Repeal. All ordinances or parts of ordinances in conflict herewith are hereby repealed.

Section 13. When Effective. This ordinance shall be in full force and effect from and after its passage, approval and publication as by law provided.

W. D. HAYES, Mayor.

Passed July 23, 1937.

Approved July 23, 1937.

Attest:

Edgar V. Moore, City Clerk.

## Resistance Welding

(Continued from page 31)

cloth is recommended for cleaning and removing any zinc, tin or lead deposit. A file is not recommended because the rough welding surface left from file dressing tends to cause pick-up of the coating from the steel. Under certain circumstances it might be advisable to redress the points in a lathe or a suitable machine which would give a smooth surface.

*e. Strength of Welded Parts.*—The strength of resistance welded coated steel sheets is approximately 90 to 100% that of the original material.

(To be continued)

# INDEPENDENT BASEBOARD REGISTERS

*with* **REMOVABLE GRILLES**



- WROUGHT STEEL    ● EASILY INSTALLED
- SINGLE VALVE     ● PLEASING DESIGN
- LARGE OPEN AREA   ● FINE FINISH

Tension on valve mechanism holds valve in any desired position.

**SEND FOR CATALOGS**

**THE INDEPENDENT REGISTER CO.**

3741 E. 93rd ST., CLEVELAND, OHIO



## XX<sup>TH</sup> CENTURY FURNACES



**KEEP OLD MAN WINTER ON THE RUN**

**XX<sup>TH</sup> CENTURY HEATING & VENTILATING CO.**

AKRON, OHIO

## FURNACE • STOVE and BOILER REPAIR PARTS

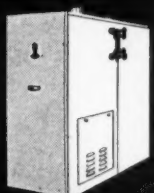
**Over 15,000 Patterns**

We Sell Jobbers and Distributors Only

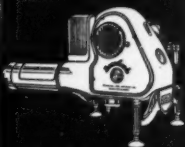
**HOMER FURNACE & FOUNDRY CORP.**

COLDWATER      -      MICHIGAN, U. S. A.

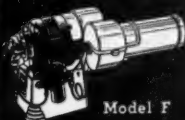


**15<sup>TH</sup> YEAR** *Everything to Gain***BRANFORD**

Boiler-Burner Unit



Models A and E



Model F

COMPLETE LINE  
FOR  
ALL HEATING  
CONDITIONS

**OIL BURNERS**

start you right, and a  
good start is vital

**T**HERE'S no burner you can offer your customers that will give more dependable performance year after year than a Branford. There's everything to gain in starting right now with a Branford Franchise. We will help you sell, install and service. You get the full price immediately when the job is completed.

Write us for details

**MALLEABLE IRON FITTINGS CO.**

Serving the Heating Industry  
for 74 years

DEPT.  
42

BRANFORD,  
CONN.

OBI



Ideal for use on auto bodies; blowers, fan and air conditioning equipment; conveying equipment; railway coaches; signs, machines and tools, agricultural implements, etc.

Cut can be started in center of sheet without starting hole. No further finishing required. The metal is sheared, not punched. Easily operated.

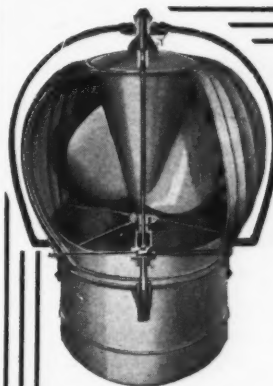
There's a Libert distributor in your territory—or write for complete information.

**LIBERT MACHINE CO.**

**Green Bay, Wis.**

Manufacturers of shears since 1915

**Libert Hi-Speed SHEAR**



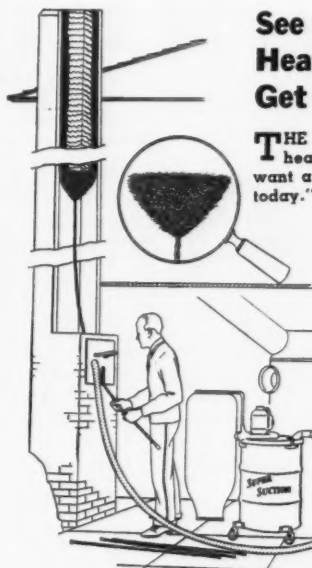
*Mastering*  
**EVERY**  
*Ventilating*  
*Job!*

When you sell Allen Turbine Ventilators, you have a line that meets every job you are asked to handle. Our complete descriptive literature giving specifications of each type of Allen ventilator is available (free) for your files. Please write for it if you haven't it.

The precision manufacture—highest quality engineering and materials — which go into Allen ventilators—assure you of positive satisfaction of every customer. That means repeat orders and increasing business for YOU.

The ALLEN Corporation  
9752 Erwin Ave. Detroit, Mich.

**ALLEN TURBINE VENTILATORS**



**See How Successful  
Heating Plant Salesmen  
Get Orders . . .**

**T**HE salesman in the picture got tired hearing people say, "No, we don't want a new heating plant nor any repairs today."

So he asked his boss to buy a Super Cleaner with chimney cleaning attachments and now he goes around cleaning plants and chimneys — easy sales to make.

While the cleaning job is being done he shows the owner or the housewife about things the heating plant needs, and more often than not gets nice orders for new plants, pots, grates, smoke pipes and repairs.

Lots of heating plant salesmen today will tell you, "I'm only an order taker—this Super is the salesman." Our free Plan Book tells you all about it.

Complete chimney cleaning tools standard equipment with every Super—work from basement, not the roof.



**USE THIS COUPON**

The National Super Service Company  
1944 N. 13th Street, Toledo, Ohio

Send me the Plan Book and complete information about your free trial and the new low-priced Super.

Name .....

Street Address .....

City and State.....

## Research Residence Cooling

(Continued from page 60)

the upper limit of the range of application of the small-sized condensing unit.

(3) A statistical study of the daily median temperatures during a given number of seasons was made, and from it the limitations of the application of the small condensing unit were determined.

(4) Subject to limitations over a small portion of the cooling season, the use of a condensing unit of small capacity was shown to be feasible for residences, especially in those cases in which the initial cost of installation is a more important factor than the maintenance of ideal indoor conditions.

(5) The fact that the rise in indoor air temperature accompanying the operation of the small condensing unit on a warm day was small was attributed to the heat absorbed by the building structure and furniture.

(6) The calculations for the heat absorbed by the structure of the Research Residence indicated that a rise of 1.0 F in the indoor air temperature was equivalent to a heat absorption of over 24,000 Btu.

(7) A comparatively large plant would probably be required, even on a mild day, in order to effect a rapid decrease in the indoor air temperatures, particularly if the load on the cooling plant were increasing.

(8) The off-periods occurring during periods of intermittent operation of the plant were accompanied by comparatively large changes in the relative humidity and in the effective temperature.

(9) Subject to the limitation of restricted occupancy, the method of cooling on the first story during the day and on the second story during the night may be considered as reasonably satisfactory.

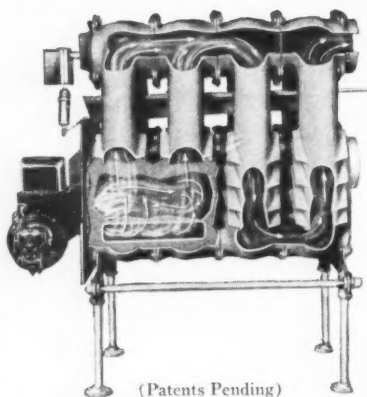
(10) The studies made with heat-flow meters applied to the walls indicated that considerable discrepancy existed between the measured values and the calculated values of the heat flow through the wall. Furthermore, thermal equilibrium was never attained in the wall section under actual conditions.

(11) Except under equilibrium conditions, the total amount of heat impressed on the wall appears not only as heat transmitted to the indoor air but also as heat serving to increase the temperature of the wall structure. The discrepancy between the maximum amount of heat actually transmitted to the indoor air, as measured by the heat-flow meter, and the maximum calculated heat transmission for the wall has been attributed to heat absorbed by the wall structure.

### Acknowledgments

The results presented in this paper were obtained in connection with the summer cooling investigation (1937) in the Research Residence† at the University of Illinois conducted by the Engineering Experiment Station of which M. L. Enger, dean of the College of Engineering, is the director, and in the Department of Mechanical Engineering of which O. A. Leutwiler, professor of Mechanical Engineering Design, is the head. These results will ultimately comprise part of a bulletin of the Engineering Experiment Station. Acknowledgment is also due to R. B. Engdahl, research graduate assistant, and to R. B. Knight, special research graduate assistant, for services rendered in connection with the investigation, and to the various manufacturers who cooperated by furnishing instruments and equipment.

†The Research Residence in Urbana, Illinois, was built, furnished, and completely equipped specifically for research work in warm air heating by the National Warm Air Heating and Air Conditioning Association in December, 1924.



(Patents Pending)

## THE UNIQUE OIL BURNING AIR CONDITIONER

*The most efficient heating unit on the market—due to*

1. All-cast Heating Element, with greater heating surfaces, tighter joints, longer life and the heat-transfer rate of steel, producing practically perfect combustion and heating.
2. Design of Heating Element which effectively breaks up air currents to provide maximum heat pick-up and uniform air temperatures.
3. Directional Fins which divert cooler air to center of Heating Element so that air currents are thoroughly mixed.

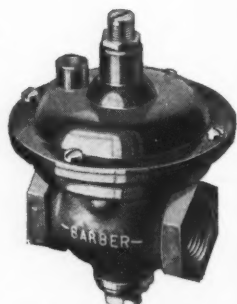
*Write today for our dealer proposition.*

**THE EXCELSIOR STEEL FURNACE COMPANY, 118 S. Clinton St., Chicago, Illinois**

## Barber GAS Pressure Regulators

Barber Regulators have everything that a Quality Regulator must have—compact, attractive appearance in keeping with the modern trend in heating equipment design—high precision standards of manufacture—operate at very low pressure drop. All bronze body, brass working parts. Sizes  $\frac{1}{4}$ " to  $1\frac{1}{2}$ ", A. G. A. approved. Write today for catalog and prices on the complete line of Barber Conversion Burners and Regulators.

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1",  $1\frac{1}{4}$ ",  $1\frac{1}{2}$ " and 2" sizes.

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Fires will soon be built in furnaces — your customer loses if they're dirty—so do you. Are you equipped to do this profitable work with a machine which is as:

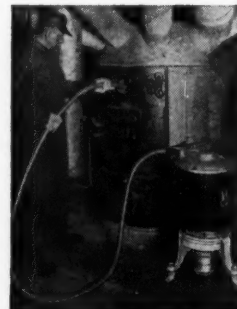
**FAST  
STURDY  
POWERFUL**

as the Kent Double Suction Cleaner? Write us TODAY AND FIND OUT.

**The KENT COMPANY, Inc.**

167 Canal St.

Rome, N. Y.





**PREMIER  
FURNACE  
CLEANERS**  
COMPLETELY EQUIPPED

**HALF HORSE POWER MODELS**  
**60<sup>00</sup> and 64<sup>50</sup>**  
**ONE HORSE POWER MODELS**  
**84<sup>50</sup> and 89<sup>50</sup>**

Premier Furnace Cleaners are powerful and light weight, yet sturdily built to stand years of rugged service. Weighing less than 50 pounds, they are one-man cleaners and have been the furnace man's favorite for years. Premier Cleaners are ideal for upstairs use and may be used independently from the container for suction and blowing use in cleaning air ducts, registers, grills, radiators and air conditioning equipment.

Motor specifications for these powerful cleaners are:  
 $\frac{1}{2}$  H.P. maximum vacuum 31 inches in water.  
 1 H.P. maximum vacuum 46 inches in water.

Business-Getting, Return Post Cards are Available for Dealers at Low Cost  
 Buy It From Your Local Jobber or Write the Manufacturer  
 Furnace Cleaning Instruction Booklet Free with Each Cleaner

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Quality equipment properly installed and correctly serviced is a winning combination you can always depend on to bring that satisfied customer's recommendation so valuable to every business. You've always been able to control the quality of your equipment; and NOW you can control the quality of your installation and service work.

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**REFRIGERATION & AIR CONDITIONING INSTITUTE**  
 Division of the Industrial Training Corporation  
 2130-2158 Lawrence Avenue • CHICAGO, ILLINOIS

## WHITNEY LEVER PUNCHES

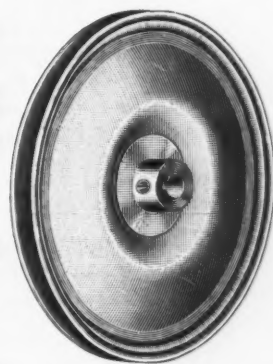
<p><b>No. 4B PUNCH</b></p>  <p>Length—8<math>\frac{1}{2}</math> inches. Capacity <math>\frac{1}{4}</math>-inch through 16 gauge. Deep Throat—2 inches. Weight—3 pounds. Punches and Dies—<math>\frac{1}{8}</math>" to <math>\frac{3}{8}</math>" by 64ths.</p>	<p><b>No. 91 PUNCH</b></p>  <p>Capacity — <math>\frac{1}{4}</math>-inch hole through <math>\frac{1}{4}</math>-inch, 1-inch hole through <math>\frac{3}{8}</math>-inch and 2-inch hole through <math>\frac{1}{2}</math>-inch iron. Depth throat 5 inches. Weight—82 lbs.</p>	<p><b>No. 1 PUNCH</b></p>  <p>Length — 34 inches. Capacity — <math>\frac{1}{4}</math>-inch hole through <math>\frac{1}{4}</math>-inch iron. Punches and dies in sizes from <math>\frac{1}{8}</math> to <math>\frac{3}{8}</math> by 64ths.</p>
<p><b>No. 6 PUNCH</b></p>  <p>Length—26<math>\frac{1}{2}</math> inches. Capacity — <math>\frac{1}{4}</math>-inch hole through <math>\frac{1}{4}</math>-inch iron; especially adapted for button punching or template work. Punches and dies <math>\frac{1}{8}</math>" to <math>\frac{3}{8}</math>" by 32nds.</p>	<p><b>CHANNEL IRON PUNCH</b></p>  <p>Companion to No. 2 Punch. Every part of the two Punches interchangeable, including punches and dies. Capacity—<math>\frac{1}{4}</math>-inch hole through <math>\frac{1}{4}</math>-inch iron.</p>	

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*Ask your Jobber*

**W.A. WHITNEY MFG. CO.**  
 636 RACE ST. ROCKFORD, ILL.

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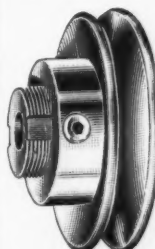
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Balanced, true running and quiet at all speeds. Built to give long trouble-free service under severest use. Made with heavy rolled steel edges and SOLID STEEL or malleable iron hubs, machined. Carried in stock for "A" and "B" belts, in a wide variety of sizes. With DOUBLE GROOVE as well as single groove.

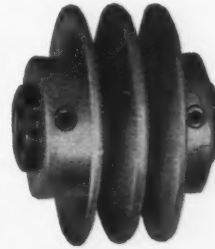
No Die Cast Hubs Used in MAUREY Pulleys.

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Single Groove

Solid steel construction. Adjustment permits speed variation of as much as 30%. Fine accurate, milled threads, 20 to the inch, assure close adjustment. Designed for Air Conditioning Units. Solid steel—not die cast. Made in 4 sizes,  $\frac{3}{4}$ " to  $4\frac{1}{2}$  inches in diameter.



Double Groove

**MAUREY MANUFACTURING CORP.**  
 Wabash at 29th Chicago, Ill.



## Swanda of Oklahoma City

(Continued from page 25)

half car of through wall flashing. At Fort Sill, the army's artillery school and firing range, Swanda laid 1,000 squares of tile roof and 3,000 feet of copper gutter on the barracks, dispensary, officers' quarters in 1933 and 1934.

To complete this sheet metal work the shop manufactures its own ventilators, both rotary and storm band types. In a single year 1,000 rotary and 500 storm band ventilators have been fabricated. For army and government purposes a special type of tent chimney is now in fairly steady production. This chimney consists of a flue with a storm cap soldered inside a double walled pipe which has holes running through from top to bottom. The holes in the protective pipe act as ventilators for the smoke pipe and prevent the hot pipe from setting fire to the tent.

Other sheet metal products and activities include the manufacture of skylights—2,000 square feet is an average year's production. Skylights, incidentally, are mostly glazed by the Swanda men. In the last year or so enameled metal store fronts have

become popular for stores, filling or service stations, small commercial buildings and a crew of men has kept busy in this field.



The photographer caught the roofing crews on a rainy afternoon. As many as 100 men have been on the Swanda payroll in busy seasons.

Thus have Charles and Frank Swanda seen their business venture of 1903 grow. Both men are active in management today with the additional help of Pete Swanda, another brother, and Vernon Swanda, son of Charles.

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Universally accepted as the sturdiest, easiest handled, most economical electric Spot Welder on the market.

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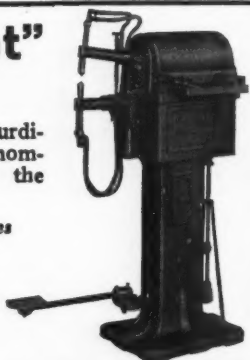
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SPOTWELD!  
with an ACME**  
Lifetime Guarantee!

Complete range of sizes

**ACME ELECTRIC WELDER CO.**

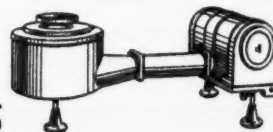
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The PAR Oil Burner is ideal for any installation. Simple in construction and operation, it has only one moving part, a 1/100 h. p. motor and fan. The Par requires no precast or brick combustion chamber, has no nozzles to leak or clog and is fully enclosed to guard against damage and prevent tampering. PAR burners protect the dealer with a five year restoration bond and an air-tight guarantee. Write us today for more information. A postcard is sufficient.

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La Crosse Wisconsin

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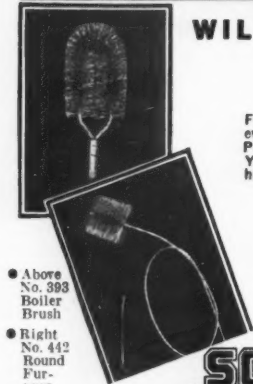
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Furnace and Boiler cleaning is an important factor in every home heating plant. The new Schaefer RUST-PROOF FLUE AND FURNACE BRUSHES offer YEARS of efficient service at a price only slightly higher than the cheap profitless brushes you have been selling. Fast-cleaning wire brushes are made of a special Silvery Brite special alloy steel, thoroughly RUSTPROOF, not merely treated with rustproofing solution. Here's Quality that will sell—at a margin of profit worthwhile to you. Let us tell you of the aggressive Merchandising Plan behind Schaefer Rustproof Flue and Furnace Brushes.

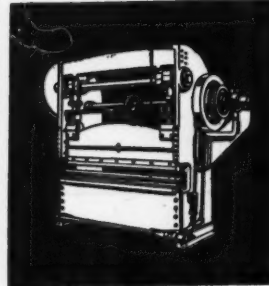
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117 West Walker St., Milwaukee, Wis.

**SCHAEFER BRUSHES**  
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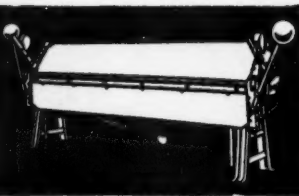


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Cuts circles, scrolls and squares as easily as a straight line. Will cut alloy metals.

Now furnished with serrated blade unless otherwise ordered.

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The first Grand Rapids Furnace Cleaners put out years ago are still in use. Dealers say they are the best with no wear out to them.

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● Use Nu-Dry and have a gasket that will allow for expansion and contraction of the castings without cracking.

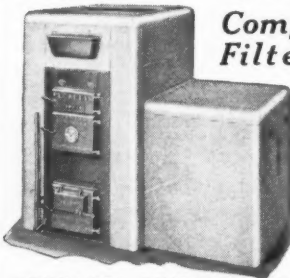
- ★ Will not crack, bloat or powder when furnace is fired immediately after applied.
- ★ Withstands high temperatures.
- ★ Keeps joints tight at all times.
- ★ Takes less material to set a furnace.

Send for free 5½ lb. sample.

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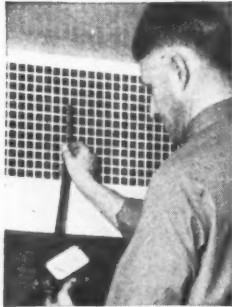
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WITH THE

### "ALNOR" VELOMETER

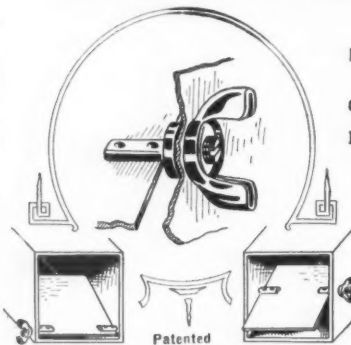


This all-purpose air velocity meter indicates air velocities directly and instantaneously on the scale in f.p.m. without the necessity of timing or mathematical calculations. Standard range 0-300, 0-3000 f.p.m. Other ranges available up to 18,000 f.p.m.

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## New Literature

For your convenience in obtaining copies of new literature, use the coupon on this page.

### 268—Heavy Duty Furnaces

E. K. Campbell Heating Co., 2441 Charlotte St., Kansas City, Missouri, is distributing a 8-page folder describing their furnace fan system for public buildings, with a description of the principles on which the design and construction of the furnace is based, resulting in high efficiency and low fuel bills.

### 269—Filter Installations

Air-Maze Corporation, 812 Huron Road, Cleveland, is distributing an 8-page catalog entitled "Air-Maze Installations Are Easy to Plan." Suggestions on planning air filter installations is the subject with specification tables for filters with frame and frames only, including list prices, and general technical details.

### 270—Turbine Ventilator

Kleenaire Corporation, Stevens Point, Wis., is distributing an envelope stuffer with space for dealer imprint, illustrating and describing their Kleenaire (ball bearing) rotary turbine ventilator, which rotates at a high speed with even a slight breeze, for factories, etc. There is a smaller size which they say is a sure cure for sluggish chimneys and fireplace flues.

### 271—Shutters and Dampers

The Elgo Shutter & Manufacturing Co., Detroit, Michigan, is distributing a 4-page folder illustrating their shutters and dampers for ventilating installations. The company makes automatic shutters, automatic back draft dampers, stationary shutters, hand-operated shutters, balanced vent units, automatic ceiling dampers.

List prices are included.

### 272—Dual System Air Conditioning

Carrier Corporation, Syracuse, N. Y., offers a leaflet explaining how radiation heating will be used for the air conditioning of larger homes in certain parts, such as the bathroom, kitchen, sun parlor, remote wings, etc.

The Carrier Dual System provides heat and complete winter air conditioning from a single unit. The summer air conditioning is also available with the use of a matched unit.

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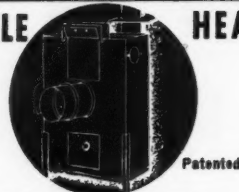
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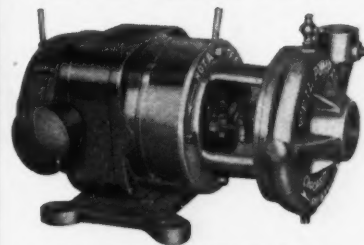
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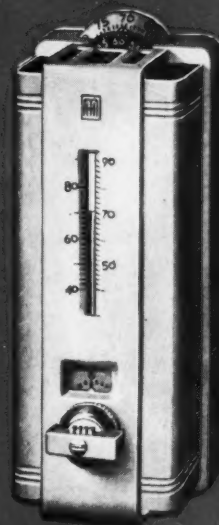




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Take the advice of an  
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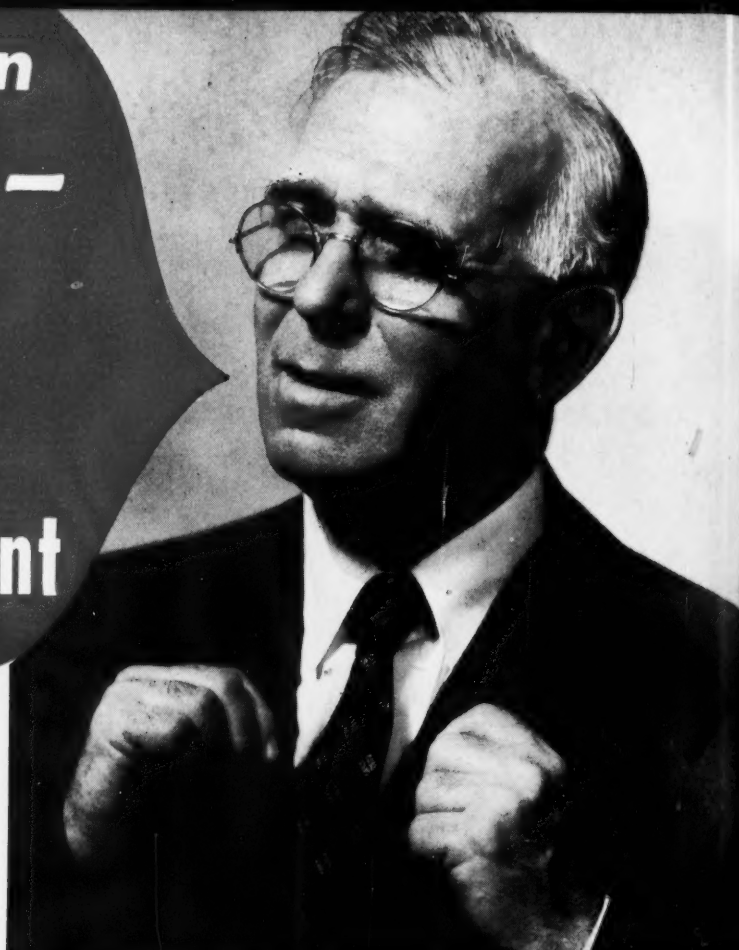
You can count on **MILCOR**  
service and **MILCOR** products.

*Use them for profitable,  
trouble-free business.*

It pays to do business with Milcor for all your rain-carrying equipment. It pays dividends of confidence that every detail of the job is right — and confidence that deliveries will be made on the dot. For Milcor has everything you need in one complete line. And Milcor's five big plants are conveniently located to give you quick, dependable service.

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Units of the Complete **MILCOR**  
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**KUHN'S CUTTER** The beautiful square eaves trough (right) that costs no more than ordinary half-round. Seven exclusive construction features make it stronger and better-looking, giving you a job you can be proud of.

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